

COAL AGE

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No. 14

THE manager of a large coal company said recently: "We have but few problems to solve in our industry—mining practice is about the same today as it was many years ago. We know now, as then, that gas will explode; that dust is an added danger; that weak roof must be supported, and that high extraction with low cost spells success. It's not education we want, it's better prices for our product."

The secret was out—at last I knew why the company managed by this man didn't pay. The coal he mines is unequalled in quality; the physical condition of the beds is favorable to easy development at low expense. Superintendents were changed time and again, but the result was always the same—failure. The policy of the man higher up—"it's not education we want"—had filtered down to the newest foreman at the smallest mine.

When higher prices come, and it's certain they will, this particular manager will not profit so much as other operators who have dealt less in generalities and paid more attention to details. Furthermore, tired stockholders may come to believe that a pioneer in progressive thought is better than a pioneer in material fact; that present ability coupled with modern ideas are greater assets in a coal operator than reputation as an early settler.

Nothing is so easy as for a mine manager to call his subordinates before him and say: "Keep your mines safe; avoid accidents; get the maximum tonnage from each acre, and show me a low cost."

As far back as the days of Solomon, we've been told that success in individual management depends on knowing more about your particular business than do the men you boss. Their respect and obedience are lost when they learn you are master in name only.

When that mine foreman or superintendent, with a head full of ideas, but possessing little tact, says to you, "Shall I construct an 'overcast' or 'undercast'? Do you want it built in, or driven solid? Will we use wood, iron or concrete?" What will you answer?

The same foreman may inquire about timbering, and ask whether to remove the bark, and if he shall

have the men put the large or the small end of the prop up? Perhaps the roof is frail, or drawslate overlying the coal falls easily and it becomes necessary to adopt systematic posting. Maybe it is his opinion that the substitution of steel props on entries and airways will result in greater economy and safety. How much do you know about the subject?

Then there's the dust problem; it's easy to say, "take care of it"; "render it harmless"; but your men will want more explicit instructions. Will you tell them to install a system of spraying? Perhaps your clay bottom won't stand for it. Likely a steam jet played on your intake will be suggested as a remedy. What will be the effect on your roof and men?

As to shooting your coal—what decision have you reached? Is it permissible explosives or black powder? What are the benefits of each and how do they compare in cost? It's probable a powder suitable for one of your mines will prove unfit for another.

Have your miners permission to mix dynamite with black powder? Do they use fuse, squibs, or electricity, and why? Do you reduce circulation before firing? Are your fans exhaust, or blowers, and are they reversible? Why have you such preferences?

Yes! the coal industry has problems a-plenty, and the fact that so many of us differ in our opinions shows conclusively that satisfactory solutions have not yet been found. I might occupy pages in a statement of lesser questions without touching at all on the greater propositions, such as "mine inspection," and "employers' liability," which are vital to the very life of our productive activity.

We have advanced, for mining in many districts today bears little resemblance to the practice of a few years ago. Experience and research have cleared our vision and we see before us a new vista embracing many dangers, but more numerous possibilities.

Any coal operator who is satisfied with what he is doing, has reached his culminating point—he will progress no more. Too often we mistake movement for improvement. The measure of progress is not the ground passed over, but what has been gained in passing.

A Compressor Plant for Mine Haulage

A compressed-air haulage system was installed in the mines of the Bergbau colliery, Neu-Essen, Germany, the early part of last year. Hauling in these mines had previously been done entirely by horses, but plans to extend the culm-filling system throughout the mines made it necessary to introduce some form of mechanical haulage. Since electric locomotives of the trolley type were out of the question, because of the bad condition of the mine roof, compressed-air haulage was decided upon, and it was determined to make use of the exhaust steam from the colliery hoisting engines to furnish power for running the compressor plant.

The compressor was designed to supply five locomotives, each having 170 ton-miles of work to perform daily. It is of the four-stage quadruplex type, as shown in Figs. 1 and 3. This type was

Special Correspondence

The plant described consists of a four-stage air compressor and auxiliaries. It supplies air at high pressure for five mine locomotives and is driven entirely by exhaust steam from the colliery hoisting engines. The operating cost is much less than for live steam or electrical power.

NOTE—Abstract from an article in *Glückauf*, by Bergat Stapenhorst.

cylinder, of 8½ in. diam., where it is brought to a pressure of 176 lb. per sq.in. The third- and fourth-stage cylinders are both single acting and of 6 in. and 3½ in. diam. respectively. Air leaves the third-stage cylinder at 500 lb. per sq.in. and the fourth stage at 1470 lb. per sq.in. pressure. The four air cylinders are connected by three intercoolers of ample capacity.

The steam cylinders, on the opposite side of the crank shaft, are rigidly fastened to the same bedplate as the air cylinders which they drive. They have a diameter of 43½ in. and are equipped with a simple and perfectly balanced piston valve gear. The size of these cylinders is sufficiently great to admit of the engines' running, not only with steam of atmospheric pressure but also with steam having an absolute pressure considerably below that of the atmosphere.

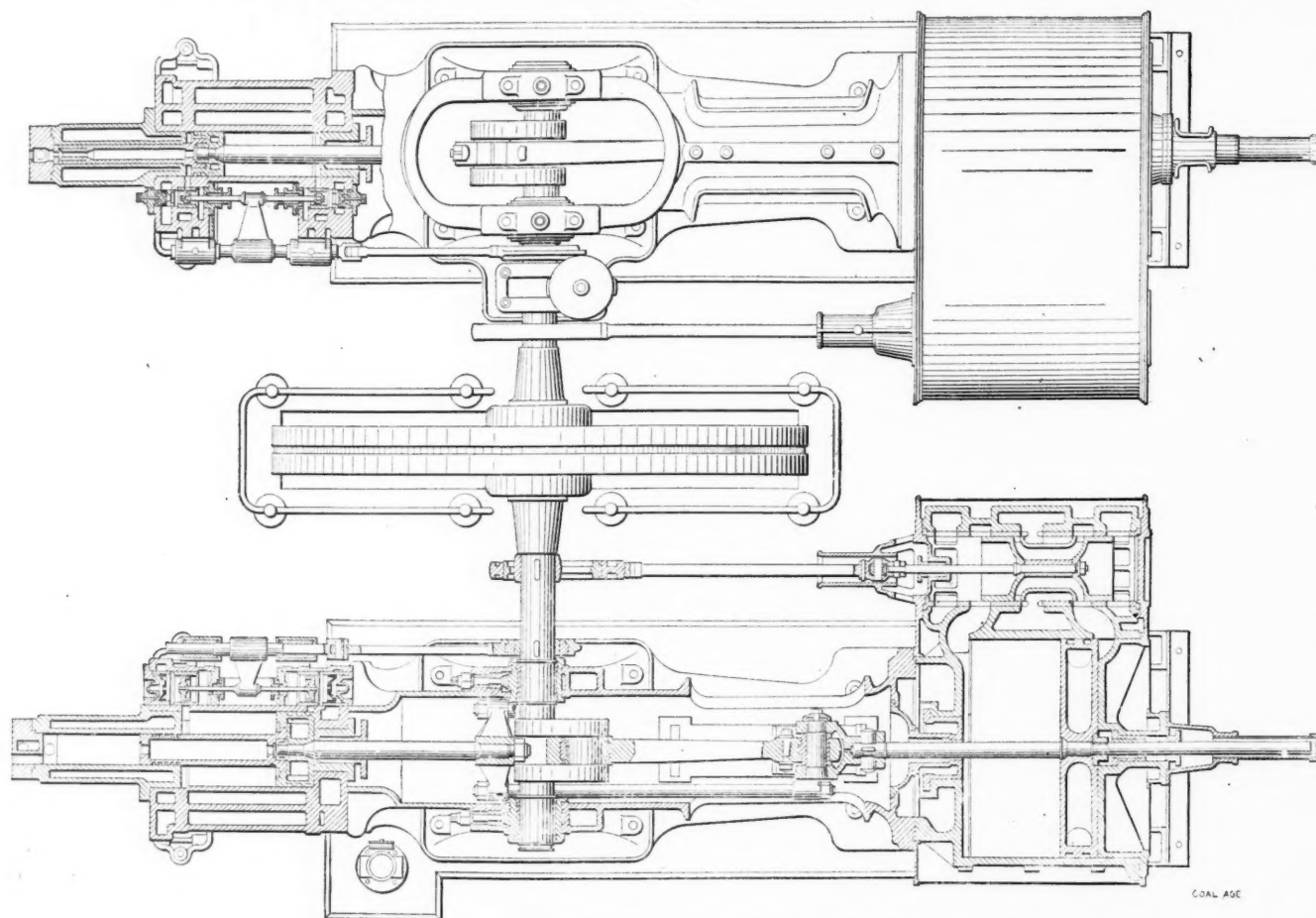


FIG. 1. PLAN OF FOUR-STAGE, EXHAUST-STEAM-DRIVEN AIR COMPRESSOR

chosen, first, because of the low delivery temperature of the air and, secondly, because it permits a nicely balanced arrangement of the cylinders on each side of the crank shaft.

The first- and third-stage air cylinders are arranged in tandem and driven by one engine, while on the other side of

the balance wheel the second- and fourth-stage air cylinders are driven in tandem by another engine. The first-stage air cylinder is of approximately 15 in. diam., is double-acting, and is designed to bring the air up to a pressure of 42½ lb. per sq.in. From this cylinder, the air passes to the second-stage double-acting

In operation, the exhaust steam from the hoisting engines passes through pipes of 24 in. diam. to a heat accumulator, attached to which there is an oil separator with an automatically working discharge. From the accumulator the steam passes directly to the valve chests of the steam cylinders of the compressor.

After expansion in these cylinders to about 3 lb. per sq.in. abs. pres., it is drawn off into a central condensing plant, which maintains a vacuum of about 25.6 in. and is equipped with a piston air pump. The steam cylinders of the compressor are made large enough, as before noted, to work with a pressure as low as $10\frac{1}{4}$ lb. abs. per sq.in., and thus not only is the usual back pressure of $1\frac{1}{2}$ to 3 pounds absent from the exhaust passages of the hoisting engine, but frequently, after a pause in the hoisting, a vacuum of as much as 6 or 8 in. is found. Therefore, this engine starts more easily, and more quickly gains its highest speed than when exhausting into the atmosphere. As a matter of fact, however, in the actual running of this plant, the foregoing condition of the partial vacuum in the

in the passage from the accumulator to the steam cylinders. This valve throttles the steam and consequently regulates the speed of the compressor engine.

From the diagram, Fig. 2, may be seen to what extent it is possible for the compressor engine to pump out the steam from the accumulator. It will be noted that during a hoisting pause of ten minutes it would be possible for a compressor plant of double the present capacity to run without any appreciable decrease in its output.

An indicator test of the compressor showed that at 120 r.p.m. there was developed in the steam cylinders 195 h.p. which compressed 406 cu.ft. of free air per minute to a pressure of 1470 lb. per sq.in. This is shown in the indicator diagrams of Figs. 4 and 6. One set of these diagrams has been "Rankinized,"

admission of any live steam; an increase of the back pressure on the hoisting engine has never been noted and the steam consumption of this engine has not been increased. Therefore, the expense of operating the compressor plant, excepting the item of attendance, is completely covered by the interest and depreciation on the cost of its installation.

The additional first cost for the exhaust-steam compressor plant as compared with an independent live-steam installation is as about as follows: Steam piping, \$1190; steam accumulator, \$5236; additional cost of exhaust-steam over live-steam compressor, \$1190; share of expense for larger condenser, \$3094; total, \$10,710. Thus, its yearly cost of operation is represented by the interest and depreciation on an additional investment of about \$10,710. Allowing

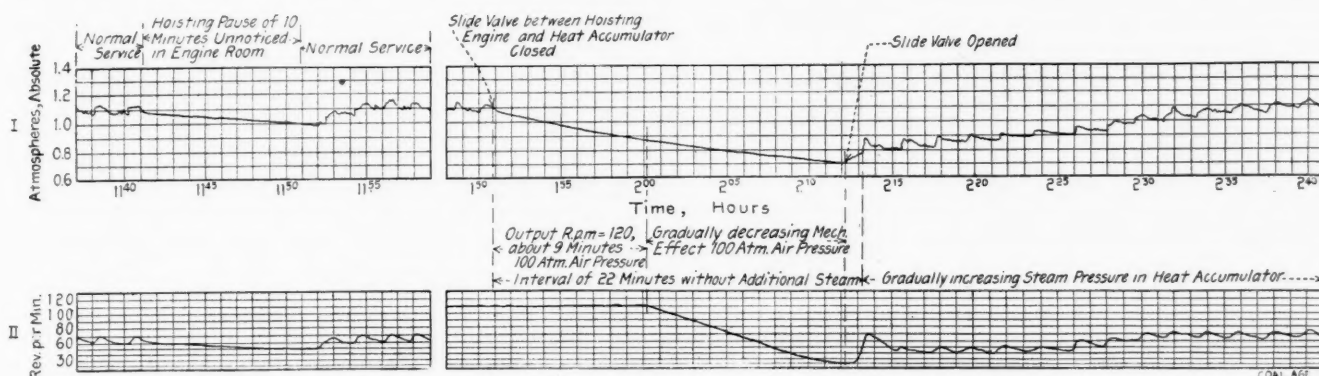


FIG. 2. (1) DIAGRAM SHOWING STEAM PRESSURE IN THE HEAT ACCUMULATOR. (2) DIAGRAM SHOWING CORRESPONDING SPEED OF THE COMPRESSOR

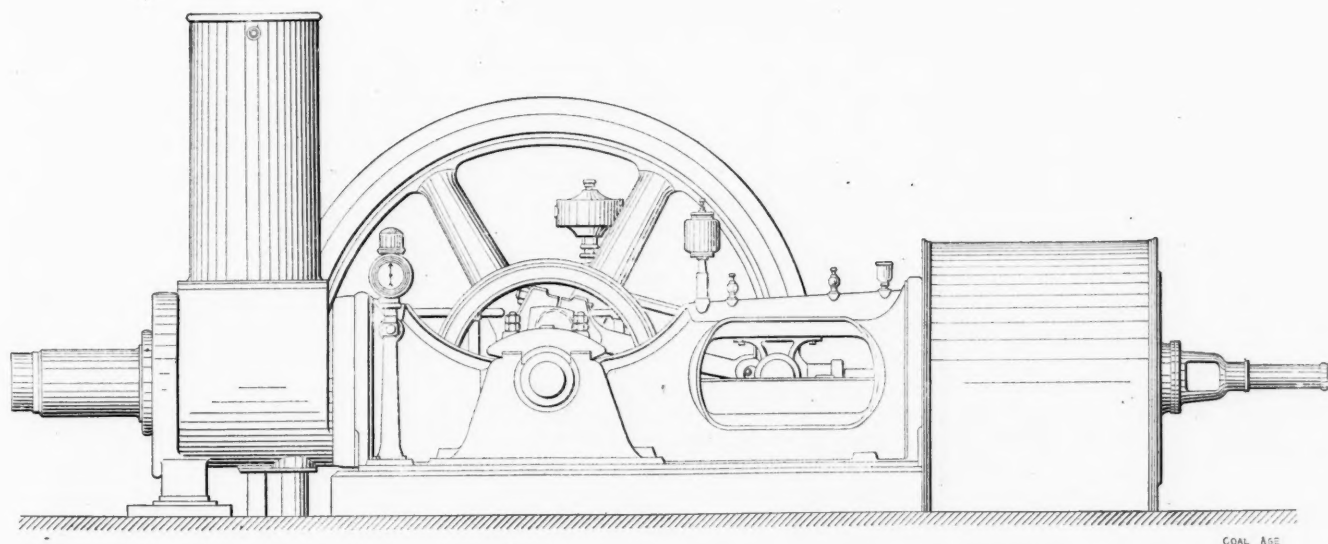


FIG. 3. SIDE VIEW OF FOUR-STAGE, EXHAUST-STEAM-DRIVEN AIR COMPRESSOR

hoisting-engine exhaust is seldom realized because this engine gives considerably more steam than the compressor demands and there are comparatively few intervals in the hoisting.

The compressor is kept from running away, in the event of an increasing steam pressure, by an automatic governor valve

Fig. 5, and shows plainly the saving effected by employing four compressor stages. The temperature of the air at delivery was 198 deg. Fahrenheit.

The economy of this installation is apparent from the following considerations: During the normal eight-hour shift, the compressor is run without the

4 per cent. for interest and 10 per cent. for depreciation, this gives:

$$\$10,710 \times \frac{14}{100} = \$1500,$$

approximately, as the annual cost.

The annual cost of developing the same horsepower with electric current

at \$7.14 per 1000 k.w.-hours and figured on a basis of 2400 working hours per year would be:

$$\frac{195 \times 745 \times 100}{91} \times 0.00714 \times 2400 = \$2741.76.$$

This is assuming an electrical efficiency of 91 per cent.

A live-steam plant with the same output would probably require 4840 lb. of steam per hour at 120 lb. gage pressure when operating condensing. Figuring the cost of steam at 21.6 cents per 1000 pounds, this gives $4840 \times \$0.000216 \times 2400 = \2507.12 as the cost per year.

At the present rate of hoisting, the five air locomotives perform daily, in

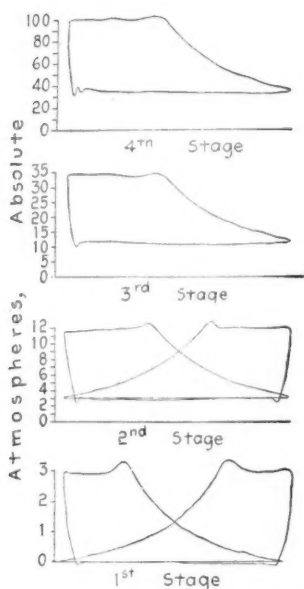


FIG. 4. AIR DIAGRAM OF COMPRESSOR

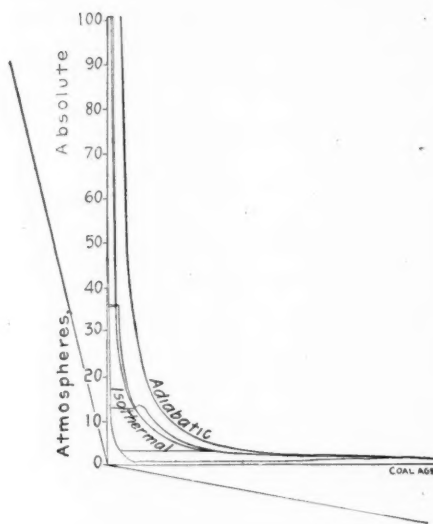


FIG. 5. RANKINIZED AIR DIAGRAM

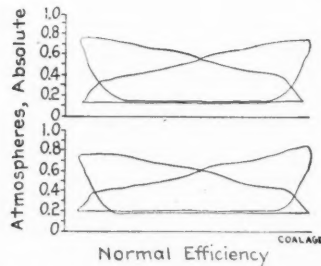
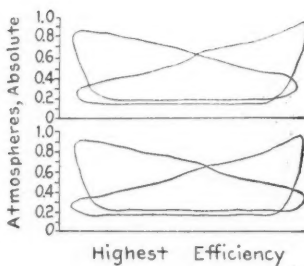


FIG. 6. STEAM DIAGRAMS

eight hours, approximately 427 ton-miles. Allowing 300 working days to the year, the cost per ton-mile per day is:

- (1) For electrical power, $\$2741.75 \div (300 \times 427) = \0.02142 ;
- (2) For live-steam power, $\$2507.12 \div (300 \times 427) = \0.01963 ;
- (3) For exhaust-steam power, $\$1500 \div (300 \times 427) = \0.0117 .

This shows that the exhaust-steam power, although not as yet fully utilized, is still cheaper than either live steam or electric energy and it is expected that this fact will be demonstrated to a much more marked degree when it is possible to run the plant at its full capacity.

Nystagmus

In an address before the British Medical Association, the late Doctor Snell said a miner afflicted with nystagmus, when looking at a safety lamp, owing to the oscillation of the eyeballs, gets the impression that the object looked at is in motion; thus he sees his safety lamp as if it was moving or dancing. The motions, of course, bear a corresponding relation to those of the eyeball. They would be more rapid if the oscillations were rapid, and as these motions might vary from 100 to perhaps 350 in a minute, the apparent movements of the safety lamp might be so rapid that they would produce little more than the appearance of a

eyes became steadied so that the lamp ceased to spin round he could recognize a gas cap. Another, in whom nystagmus was slight, could only see a large cap. Another, in whom nystagmus was much marked, reeled like a drunken man when rising from the position on the floor he had assumed as for work. In yet another case, the whole lamp appeared to be swinging round, and the man could see no cap until the lamp was full of blue flame.

It has been a contention how far the frequency of nystagmus has been affected by the indifferent illumination afforded by safety lamps, or by other means of lighting employed in the mine. But it is found, according to Doctor Snell, accompanying all kinds of illumination underground; for example, where electric or large oil lamps, affording abundant light, have been employed. Its total independence of indifferent illumination was, moreover, definitely proved by the observation of many cases occurring among men employed aboveground.

The ordinary method adopted for the detection of firedamp in coal mines is by reducing the size of the oil flame of the safety lamp until the luminosity almost disappears. Then the firedamp, if present, burns as a pale-blue flame or "cap" above the oil light, this cap being due to the presence of gas in the air. The amount of gas present can be approximately estimated by the appearance and dimensions of the "flame cap." The oil-flame method does not clearly detect less than 2 to 3 per cent., but for some purposes it is desirable to recognize a smaller quantity even than the lower of these percentages. Nystagmus undoubtedly hinders the accurate observation of the presence and size of the cap, and the action of this disease becomes more marked as the working day advances.

Pennsylvania Coal Resources

The area known as the Foxburg and Clarion quadrangles, in northwestern Pennsylvania, is one of the most interesting and important which has been studied by the United States Geological Survey. This area, which comprises about 450 square miles, lies in the great coal, oil, and gas-producing region of western Pennsylvania, and a geologic folio (No. 178) describing its geology and mineral resources has been published.

The area is drained by the Allegheny and Clarion rivers. The rocks occurring in it are mostly of Carboniferous age, the sediments of which they were formed having been laid down in the great period that is notable for the accumulation of beds of coal. The layers of rock are nearly flat and are in this respect different from those in eastern Pennsylvania, which were tilted and bent and broken in the great mountain-making movement that gave rise to the Appalachians.

light blur. The oscillations might be to and fro, rotary, or the two combined, and a miner frequently described the safety lamp as appearing to move rather more in an ellipse than in a circle.

Doctor Snell examined 48 miners, and their incapacity to detect a gas cap, unless a dangerous amount of gas was present, was very marked in all. One miner did not see even a big gas cap, explaining that the lamp appeared to be "spinning too much." Another could not distinguish a small cap under any circumstances, but when he steadied his eyes he could recognize a cap 1 in. high. Another could not see a cap because the lamp appeared to be jerking about, but when his

Coal Mine Ventilating Equipment

By W. M. Weigel *

Ventilation of mines is necessary: First, to furnish a sufficient supply of fresh air for the breathing purposes of the men and animals employed in the mine; and second, to drive out or dilute explosive and inflammable gases, which, if allowed to accumulate, may be accidentally ignited with resulting injury or loss of life, and serious damage to the mine workings.

Ventilation is also necessary to remove the gases that are formed by the discharge of explosives, and are injurious to the health of the workmen, if not actually poisonous, and also the gases given off by the decay of mine timbers and the oxidation of ores. In coal mines, almost without exception, some form of artificial ventilation is necessary.

METHODS OF VENTILATION

Mines may be ventilated in five ways: 1. By natural ventilation. 2. By furnaces. 3. By the waterfall, or trompe. 4. By steam jets. 5. By mechanical ventilators.

The term natural ventilation as generally applied denotes the production of an air current without the use of any special device or apparatus for setting the air in motion. Natural ventilation depends for its action on the difference in weight between two columns of air of different densities, the flow of air being from the heavier to the lighter column. The difference in densities is primarily due to the difference in temperatures of the two columns, or in general, the downcast or intake must be the cold column and the upcast or outlet the warm column. For this reason in naturally ventilated mines it is quite common for the air current to have in summer a direction opposite to that which it has in winter. In winter the outside air, being colder than the mine air, reduces the temperature of the intake and consequently makes the density and weight of the intake air greater than that of the return air. In summer if the outside air is warmer than the mine air, the density and weight of the intake air may be decreased to such an extent that it is lighter than the return air, and a reversal of current is effected.

Furnaces for mine ventilating purposes are now practically obsolete, although there are some still in operation. Their action is based on the same principle as that of natural ventilation; namely, the difference in temperatures, and hence densities, of two air columns. Furnaces are generally placed near the foot of the upcast shaft; they are usually built of brick and occupy the full section of the return airway. To protect the ribs and roof from the heat of the furnace, air spaces are left between the furnace lin-

Various methods have been employed in the past to secure the ventilation of mines. Ventilation by mechanical means has come into general use during the last sixty years. This is the first of a series of articles dealing with mechanical ventilators.

*Associate professor of mining, Pennsylvania State College, State College, Penn.

ing and the masonry next to the ribs and roof, through which air freely circulates. The furnace arch is generally semi-circular.

Since it is not, in general, considered a good plan to pass all the mine air through the furnace, and since in the case of gaseous mines none of the mine air should come in contact with the fire, what is known as a dumb drift is generally employed. This is a drift, usually sloping, which starts upward from the return airway 100 to 150 ft. back of the furnace, and passing over the furnace, joins the upcast shaft at a point high enough to avoid the flames. Between the lower end of the dumb drift and the furnace, a tight stopping is interposed and between the stopping and the furnace a small crosscut connects with the intake airway to supply the furnace with comparatively fresh and safe air. This small crosscut is fitted with regulator doors to control the supply of air. By this arrangement a current is established in the main airways without allowing any of the return air to pass nearer to the furnace than the point at which the dumb drift joins the upcast shaft.

FURNACE VENTILATION NOT SUITED IN ALL CASES

Ventilation by means of a furnace is not suited to mines which require a high water gage and have shallow shafts, because there is a definite limit to the temperature to which it is possible to heat the air of the upcast shaft, and when this temperature has been reached, the ventilating pressure is directly in proportion to the depth of the shaft. Obviously the maximum pressure obtainable is soon reached in the case of a shallow shaft.

Ventilation by a waterfall or trompe consists in diverting a stream of water down a shaft, which should be vertical or nearly so. As ordinarily arranged, the

trompe is a small box or compartment in the shaft, fitted on opposite sides, with inclined shelves, which extend from one side nearly to the other. The water entering the top is broken up by a screen or perforated plate in order to better entrain the air, and part of the way down the shaft there are openings in the sides of the compartment for the admission of air which the water is supposed to catch and carry down. It is probable that the action of this device is largely due to the cooling of the air in the shaft, and thus making it the downcast in a system of natural ventilation. This would seem to be indicated by the fact that anything which breaks up the water and presents a large surface to the air seems to answer the purpose quite well, such as a brush mat for the water to pass through, or a spray from the nozzle of a hose.

This means of ventilation can best be employed only where the mine has natural drainage from the bottom of the shaft, and where a source of water is available at the surface; conditions which do not usually obtain. It may, however, be useful in the case of an emergency, such as the destruction of the regular ventilating equipment, when it is necessary to get into the mine promptly for rescue purposes. For such work it is not essential that there should be natural drainage from the shaft bottom or lowest level of the mine.

TEMPORARY VENTILATION

Ventilation by means of a steam jet or nozzle is only resorted to for temporary work, as in sinking a shaft or slope, or for small mines. This method may be applied in two ways: One is to carry a steam pipe to the mouth of the shaft and turn it upward into a nozzle over one of the compartments. The air around the jet being driven upward, there is created a partial vacuum which is filled by air from the shaft compartment beneath. The second and better method is to carry the steam line to the bottom of the shaft, and direct the steam jet upward by means of a nozzle leading into one of the shaft compartments, or a small compartment of boards or sheet iron built especially for the purpose. The upward air current is maintained by the velocity of the steam issuing from the nozzle, and by the decrease in the weight of the air due to a rise in temperature derived from the heat of the steam and the water vapor.

The steam jet as a ventilator has a low efficiency, probably never exceeding 12 to 15 per cent., and the deeper the shaft the less the efficiency becomes, due to the cooling of the upward air current, followed by the precipitation of the water vapor.

USE OF MECHANICAL VENTILATION

Mechanical ventilation of mines, as the term is generally applied, means the passing of an air current through all or part of the workings by means of some mechanical device either rotating or reciprocating, which in turn is driven by a motor, operated by steam, air, gas, electricity or water power.

Mechanical ventilators may be employed to force the air into the mine through the intake or downcast shaft and out through the upcast shaft or outlet, or they may operate by exhausting the air at the outlet or upcast in which case the partial vacuum there formed sets up an air current from the downcast to the upcast shaft. Sometimes they are placed underground between the downcast and upcast shafts, in which case they operate both as a blowing and exhausting device.

These ventilators vary in size from the small centrifugal blower used to ventilate the face of a single drift or tunnel and requiring but three or four horsepower for operation, up to the large colliery fans, ventilating all the workings of a large coal mine and consuming 300 h.p. or more.

Many different types with fairly good mechanical efficiencies have been employed within the past 60 years, but American practice has been confined largely to two general types, namely; the centrifugal fan either blowing or exhausting, and the disk or propeller fan. The former is the more important.

COMPARISON OF METHODS

In all methods of ventilation two openings into the mine are required. These may be two separate shafts or drifts, connected by the underground workings, or a single shaft or drift may be divided into two airways by an approximately air-tight partition. It is better to have two separate mine openings, and in fact the laws of most states and countries now require such an arrangement, so that if an accident should occur to one of them the men can reach the surface by the other.

As to which will be the upcast and which the downcast will depend on local conditions to some extent. The difference in depth of the two openings, and the difference in elevation of their portals or mouths has an important influence on the natural ventilation, and if possible the artificial ventilation should take place in the same direction as the natural, in order to get a maximum efficiency. In general the shaft or drift having the greater elevation at its intersection with the surface should be the downcast in summer and the upcast in winter. This would, however, necessitate a reversal of the current to suit the seasons, an operation which is seldom possible in the case of extensive and complicated underground workings and systems of air distribution. In the case of furnace ventila-

tion the shaft with the higher outlet is, of course, always the upcast.

With mechanical ventilators exhausting the air from the mine, the working shaft or drift is the downcast or intake, and with mechanical ventilators blowing into the mine the working shaft or drift is the upcast or outlet. This arrangement is necessary for the reason that it is difficult to construct the working outlet of a mine in such a way as to make it air tight against a head of air sufficient to create the proper ventilation, without seriously interfering with traffic.

The mine resistance or the pressure necessary to pass the required amount of air through the mine will have an important influence upon the type of ventilator to be installed.

FURNACE VENTILATION

Natural ventilation and ventilation by means of steam jets and trompes is so limited in application that any comparison of these methods with the furnace and mechanical ventilators would not be possible. Furnaces, although now rarely used, and in many districts prohibited by law, have the following advantages: First, their first cost is less than mechanical ventilators; second, their cost for repairs and maintenance is low; third, they are easy to control and are not dependent on the boiler or power plant for their operation. Among their disadvantages may be mentioned: First, they are dangerous in gaseous mines; second, in case of an explosion or mine disaster, ventilation cannot be restored from the surface; third, it is impossible to reverse the direction of the air current; fourth, they do not work well in connection with shallow or wet shafts; fifth, the upcast shaft cannot be employed for any other purpose; sixth, there is always danger of setting fire to the coal or to the shaft timbers in the upcast; seventh, their fuel consumption is high and their efficiency is low. The furnace requires from 2 to 6 times the amount of coal that a fan of good design would require to accomplish the same work.

The chief advantages possessed by mechanical ventilators and especially centrifugal fans that have caused their almost universal adoption, are their good mechanical efficiency, ability to reverse the air current at will when fitted with arrangements for so doing, comparative safety from the effects of explosions if properly located, their ability to increase the quantity and pressure of the air within certain limits and thus keep up with the growth of the mine, and the ease with which they may be arranged to be operated from any available source of power. Another point in their favor, although not one of which use is often made, is the possibility of moving the fan from one shaft to another of the same mine in order to better meet the needs of the mine air courses.

Utilizing Waste Coal

According to Consul Walter C. Hamm, an illustration of the feasibility of using waste coal for power purposes has just been given in Hull, England, where a new water-tube boiler has been installed in a mill. The success of this installation shows, it is claimed, that much coal which has heretofore been rejected as worthless can be used, and that greater efficiency can be obtained from this waste coal by the new method than from the best coal by the old method.

The system employs the well known principle that almost perfect combustion can be obtained by mixing air in proper quantities with pulverized coal before the two are introduced into the furnace. This insures better combustion with less air and a consequent increase of boiler efficiency by reducing the amount of heat carried away by the escaping gases. The results obtained are claimed to be as follows:

(a) Losses are almost eliminated, as all the fuel is burned in suspension and the amount of unconsumed coal in the furnace at any given time is infinitesimal.

(b) Steam is raised rapidly under ordinary conditions. The system differs from others in that with ordinary furnaces some time is taken before the fires are completely alight, but in this case as soon as the boiler is fired the theoretically full effect is obtained.

(c) The smallest and cheapest kinds of "slack" are burned with ease, and high efficiencies are obtained.

(d) The arrangements permit a close inspection of the straight vertical tubes.

(e) A reduction is made of the supervision necessary.

Coal dust costing \$1.25 a ton, which could not be used in any other way, was burned under this boiler and gave equal efficiency with coal costing \$2.50 a ton used with the old style of boiler. In 26 minutes a steam pressure of 180 lb. can be obtained.

Trial of Coke Breeze Briquets

That the firing of steam boilers with briquets made from coke breeze is quite within the limits of practical application seems to be well established by several recent tests conducted at the Constantin der Grosse mine, near Bochum, Germany, by Bütow and Döbelstein. The briquets were made three days before the trial, using 10 per cent. of pitch as binder. In the first trial, 220½ lb. of fuel were burned per hour, and an evaporation of 3.22 lb. of water per square foot of heating surface, or 6.9 lb. of water per pound of fuel used was attained. A subsequent test using a greater amount of fuel per hour showed a smaller efficiency. Taking the figures of test No. 1, the total cost of generating 1000 lb. of steam was, including labor, fuel, feed water and depreciation and interest, about 22½ cents.

Determination of Moisture in Fuel

By J. A. P. Crisfield*

When purchasing and using coke and coal, the presence of moisture in the material purchased is objectionable for at least two reasons: First, the water is purchased and paid for as fuel and, second, the water so purchased necessitates the combustion of some of the fuel to drive it off from the whole bed. Thus we are not only paying for a worthless material as good fuel, but we are penalized as well.

Bituminous coal, and frequently coke, is received at destination in open cars of the gondola type, and in transit is liable to be soaked by heavy rains, sleet or snow. Usually the shipment is paid for by railroad weights, and if the car was weighed before the contents were water-soaked, the purchaser suffers no loss from the first objection named; he must, however, still encounter the cost of boiling off the water accumulated in transit.

FUELS TESTED FOR MOISTURE

In order to give an idea of the amount of water which some well known fuels will absorb, samples of oven coke, run-of-mine steam coal and Fairmount gas coal were subjected to the following test:

The fuels were wet down with a hose, drained by being placed in perforated galvanized-iron pails, and weighed. These pails were then hung in a normal atmosphere at a temperature of 70 deg. F. and weighed at intervals of one day until ten days had expired. The details of this test prove that in the case of oven coke the wet sample lost 14.6 per cent. of its weight, due to the evaporation of the moisture which it originally contained. With the steam coal, the loss was 13.3 per cent.; but with the Fairmount, screened gas coal, the aggregates consisting of clean cubes about egg size, the contained moisture was only 2.2 per cent. Other tests of retort coke from coal-gas plants show that the coke will absorb water to the extent of 22 per cent. of its dry weight if exposed to rain.

RESULTS OF TESTS

A. Camden oven coke, egg size.		
Weight of dry sample.....	9.9 lb.	
B. Quemahoning boiler coal, run-of-mine.		
Weight of dry sample.....	16.7 lb.	
C. Fairmount gas coal, screened; egg size.		
Weight of dry sample.....	16.3 lb.	
	Per Cent. of Moisture	
Elapsed Time	A	B C
Start.....	14.6	13.3 2.2
18 hours.....	11.3	9.6 1.2
3 days.....	7.4	5.9 0.9
4 days.....	6.6	4.6 0.7
6 days.....	4.5	2.3 0.6
7 days.....	3.3	1.7 0.6
10 days.....	2.5	1.3 0.6

It is evident, therefore, that unless we have some knowledge of the content of moisture in the fuel, we may pay 15 per cent. more for a ton of carbon in the

Determination of the moisture in fuel is essential to the proper working of some industries. Standard methods of testing are open to objections. The determinator described in this article was devised to give accurately the moisture content of fuels under actual working conditions.

*Engineer of construction, United Gas Improvement Co.
NOTE—Abstract of article published in *Journal of the Franklin Institute.*

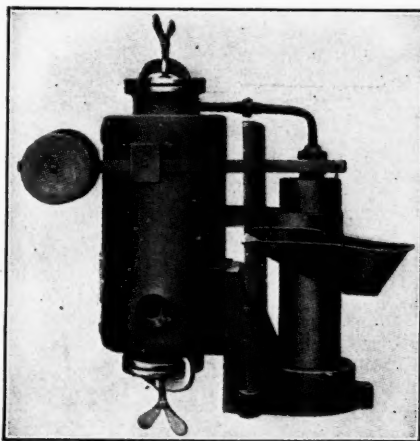


FIG. 1. MOISTURE DETERMINATOR, ASSEMBLED

case of wet fuel than we do in the case of dry fuel. The significance of this possibility becomes more apparent when we consider the case of a carbureted water gas plant manufacturing 10,000,000 cu.ft. of gas a day, with a consumption of 150 tons of coke daily. The value of this dry coke at current prices is \$675. If, during the process of quenching, or at any time previous to weighing, it has absorbed 10 per cent. moisture, the increased cost to the gas company, over and above what it would pay for dry coke, is \$75 a day, or, in a year of 365 days, \$27,375. In addition to this expense, the cost of boiling off this water from the fuel after it is put into the cupolas will be, in the case of a plant discharging the stack gases at a temperature of 1500 deg. F., 2 per cent. of the total fuel consumed. This would add another expense of \$13.50 per day, or \$4,927.50 yearly.

Where high guarantees are made of the consumption of carbon in water-gas apparatus, the determination of the water in the fuel becomes an especially important matter. For example, the presence of 10 per cent. of moisture may readily result in a failure to obtain the guaranteed results, not only because it interferes with the proper working of the apparatus, but because it is weighed into the apparatus as fuel. Under these circumstances, great difficulty has been experienced in obtaining the content of moisture in the fuel actually charged into the machine, on account of the fact that the laboratory is frequently at a distance from the generating house and considerable time elapses between the taking of the sample and its analysis in the laboratory. These conditions always operate against the guarantee of results, as there is invariably a loss of moisture, where much is present, during the transportation and handling of the sample, for which the operator gets no credit.

INACCURACIES OF STANDARD METHOD OF TESTING

In the standard method of determining moisture, the finely ground sample is placed in an open porcelain or platinum crucible, weighed, and dried for one hour in any good form of air bath. Upon removal from the oven, the crucible is covered and dried in a dessicator and again weighed. The loss in weight gives the moisture. It will be noted that before the initial weight is taken the sample has been selected on the generator-house floor, transported to the laboratory and finely ground. During all this period there is a continual loss of moisture, the amount depending somewhat upon the humidity of the atmosphere.

It was on account of the difficulties described above that an effort was made to devise a simple and fairly accurate means of making moisture determinations at the place where the fuel is consumed. The result is the moisture determinator as shown assembled in Fig. 1 and in section in Fig. 2. In this instrument a steam jacket is used to drive off the moisture, the temperature of the jacket being determined by the steam pressure and maintained at such a point that, while the moisture is driven off, the volatile combustible will be retained in the fuel chamber.

A is the fuel chamber in which is deposited the sample of fuel to be examined for moisture. Its volume is such as conveniently to hold the sample of one pound of the fuel. B is a graduated glass tube surrounded by a reservoir C containing cool water, which latter may be introduced at I and be removed at O,

thus forming a condenser. The graduations of the tube *B* are of such magnitude that when 1 per cent. by weight, of the sample is driven off in the form of moisture and condensed in the tube, the volume of the condensed water vapor driven off will just equal the volume between any two graduations on the tube.

Around the chamber *A*, forming a jacket, is the annular space *J*. Into this space steam at any desired temperature is introduced at *S* and discharged at *R*. *M* and *N* are means for filling and emptying the chamber *A*, and *K* is a ground-joint union, which permits the graduated tube *B* to be disconnected and emptied after the determination is completed.

OPERATION OF THE DETERMINATOR

The determinator may be erected on any convenient wall or table, preferably as close as possible to the point where the fuel is being consumed, thus eliminating to a great degree any change in the moisture content in the sample between the time the sample is taken and the time the moisture content is determined. The determinator is provided with a balance shown in Fig. 1, by the aid of which one pound of the fuel is introduced into the chamber *A*. Steam is then turned into the jacket *J*, and by the aid of a pressure gage on the pipe *S* the temperature is maintained at any convenient degree, preferably at 230 deg. F., as at this temperature the water may be driven off without the volatilization of any of the hydrocarbon vapors.

A cock on the discharge pipe *R* should be left slightly open so that any water condensed in the chamber may be carried off, and thus prevent it from affecting the temperature of the jacket. Previous to turning on the steam, water circulation is started through the receptacle *C* by means of the pipes *I* and *O*; also, sufficient water is introduced through the hole *E* to bring up the level in the tube *B* to the zero mark. Upon the turning on of the steam through the pipe *S* the determination begins and the instrument may be left without any attention for the space of an hour, when it will be found that practically all of the moisture is driven off from the sample and appears in the tube *B* as water, the amount of which may be read directly as a percentage of the original weight of the sample.

In addition to its other merits, the apparatus possesses the two following important qualities: 1. In its use but one weighing—that of the moist sample of fuel—is necessary, and any small error in this weighing can produce only a correspondingly small error in the moisture-percentage result; in the ordinary method, on the other hand, two weighings—one of the moist and one of the dry sample—are required, and even a small error in one of these weighings, and consequently in their difference, which is supposed to

represent the weight of moisture, may cause a large error in the determination of the percentage of moisture. 2. The moisture in the fuel is condensed to water, is visible and hence its existence is indisputable.

Before this instrument was put into service, a calculation was made to determine theoretically what would be its characteristic error. This calculation showed that theoretically the error would be about 0.13 per cent.; that is, the true content of moisture would be 0.13 per cent. greater than the indicated content, owing to the volume of the voids in the sample of fuel and of the pores of the coke itself. To check this calculation, definite quantities of moisture were added to dry samples of coke and the samples examined in the determinator, with the result that the practical error agreed with the theoretical error.

VARIOUS USES AND APPLICATIONS

Although this instrument was devised particularly for use in connection with

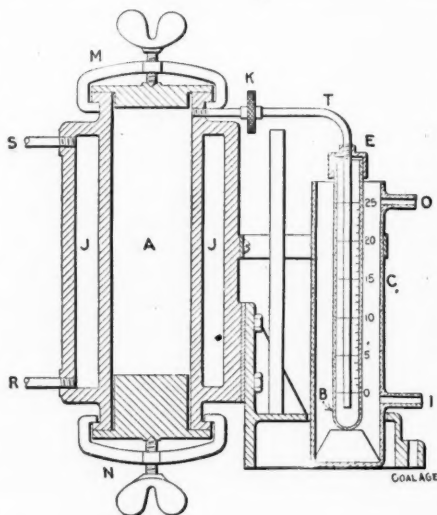


FIG. 2. SECTIONAL VIEW OF DETERMINATORS

obtaining high guarantees with regard to the combustion of coke and coal, it has been found useful in various ways. For instance, in a coal-gas plant where the yield of gas, ammonia, tar, etc., per pound of coal is figured in great detail, it is found that the uncertainty introduced by the presence of a variable amount of moisture is extremely annoying. With the use of the moisture determinator, however, this uncertainty is to a large extent eliminated. In one case it was found that the content of moisture in gas coal, as weighed into the bins, averaged as high as 9 per cent. for a period of some months. If this content of moisture had not been known, the poor results from the use of such coal would have widely misled the operating engineer.

New uses for this instrument are constantly being suggested, among them the

determination of water in metallic ores, and of water and light oils in tar. At present it does not seem practicable for everyone to purchase coal on a B.t.u. basis, but the United States government has adopted this practice, and, as it is without doubt the equitable way of purchasing fuel, we may expect before many years to see it generally adopted. In this case the determination of the moisture in the shipment purchased is of equal importance with the determination of ash and other impurities, and the field of usefulness for the moisture determinator will probably be greatly broadened.

Eighty-Ton Freight Cars

The Pennsylvania Railroad has decided to anticipate the development of several years in the size of freight cars by constructing coke cars with a capacity more than 50 per cent. in excess of that of the largest cars now in use.

The new cars are to be of the gondola and hopper type, built to carry 80 tons of material, although, owing to the great bulk of coke, they will hold only 93,000 pounds of that product. The new gondolas and hoppers are to be 52 ft. long overall, whereas the largest cars now in use, which are on the lines of the Pittsburgh & Lake Erie, are 46 ft. long.

The great increase in the carrying capacity will necessitate the strengthening of all the material entering into the steel car's construction, with the displacement of the old cast-iron wheels and the substitution of solid-steel wheels. To withstand the strain which will be put upon them by these enormous cars, many bridges will have to be reinforced, while if the use of the new cars becomes general it will be necessary also to use a heavier rail, possibly one weighing 125 lb. to the yard, laid on steel ties. The car itself will weigh 25 tons.

Size and Shape of Briquets

The size and shape of briquets should be determined by the purpose for which they are to be used. Heavy rectangular blocks are cheap to manufacture and easy to store, but have this disadvantage; they present large smooth surfaces to the fire and have to be broken up in order to get the best results. Prismatic, rounded or ovoid shapes are best for domestic purposes. The round edges tend to decrease the dust and breakage due to handling, but make the briquets harder to light. Experience has shown that ball-shaped and hollow cylindrical briquets do not give the best results.

Shotfirers should be equipped with leather cases for the safe carrying of detonators when in the process of firing. Each case should be lined and divided into 50 compartments, each compartment to hold one detonator.

First Aid in the Coal Industry

By Charles Lynch*

The purpose of the Red Cross Society is to cooperate with and to create organizations for first aid. It distributes medals and certificates of proficiency. The society also appoints a physician to devote his entire time to the coal-mining work.

*Major, Medical Corps, U. S. Army. In charge First Aid Department, American Red Cross Society.

CONTESTS AND DEMONSTRATIONS

The past year has witnessed an active campaign on the part of the American Red Cross in the coal industry, in respect to first-aid instruction. In fact, this field, on account of the important first-aid problems continually encountered, has been one in which our Red Cross has shown special interest since its first-aid department was created. The following names, well known to all coal miners, appear in the list of its first-aid committee: Dr. J. A. Holmes, John Mitchell, Prof. H. H. Stoek, Dr. M. J. Shields, Capt. W. A. May, John Hays Hammond and Carl Scholz. This certainly is an assurance that the special needs of the coal industry will be carefully considered. When the Bureau of Mines was first organized the American Red Cross was chosen as its representative so far as first-aid work was concerned. This arrangement has proved of great mutual advantage. Red Cross physicians from time to time visit the cars of the mining bureau and instruct the first-aid men employed thereon. These men have re-

An important feature of the year's work has been the various first-aid contests and demonstrations. Wherever first aid has been taught it has been found highly desirable that periodical public

Cross has relied to a great extent on local support and interest and this has never been found wanting.

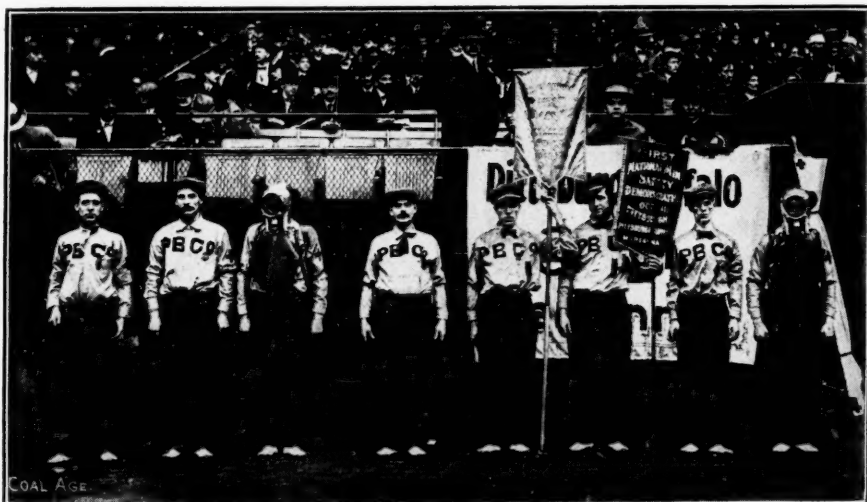
NATIONAL MINE-SAFETY DEMONSTRATION

An important part of the national mine-safety demonstration held at Pittsburg, Oct. 30 and 31, 1911, was that section devoted to first aid. It will be remembered the Pittsburg Coal Operators' Association, the Bureau of Mines, and the American Red Cross participated in the management of this demonstration. On the morning of Oct. 31 at Forbes Field, in the presence of the President of the United States, the Governors of Pennsylvania and West Virginia, the Secretary of the Interior and an audience of about 12,000 people, forty first-aid teams from all parts of the country gave a splendid demonstration of first aid. These teams had been taught, and well taught, locally and Dr. Shields, of the Red Cross, arranged their part of the program so that its success was assured. Banners were given to the teams by the Bureau of Mines and the President presented Red Cross badges and Red Cross first-aid boxes to individuals and teams participating. The coal companies concerned certainly deserve congratulations both on the showing made by their teams and their humane purpose in sending corps from such distant points to participate and thus to promote first-aid instruction with its manifest benefits throughout the United States.

During the year the Red Cross equipment and books have been added to and improved. Now the industrial edition of the first-aid book which is especially adapted to mines can be procured not only in English but in Polish, Slovak and Italian. A first-aid pouch has recently been perfected which has received favorable notice from coal companies.

INCREASE OF FORCE IN 1912

For the coming year the first-aid department of the Red Cross has in contemplation many improvements both in equipment and methods. One well qualified physician who will devote his entire time to the coal-mining industry will be employed at once and later in the year it is hoped that the Red Cross physicians engaged in first-aid work may be considerably augmented in numbers. Of course, it is not the purpose of the Red Cross to take the place in any way of the local physicians engaged in teaching first aid but to supplement their efforts and to organize first-aid instruction in districts where it has not yet been started. It intends to procure a sufficient medical staff to do this satisfactorily throughout the coal-mining industry of our country.



THE MARIANNA TEAM OF THE PITTSBURG-BUFFALO COAL CO. AT THE PITTSBURG MINE-SAFETY DEMONSTRATION

ceived instruction both on these occasions and at the mine-rescue station, Pittsburg, Penn., before their work on the cars began.

The Red Cross has also supplied each of these rescue cars with a surgeons' emergency case containing enough dressings, etc., to supply the first needs in any accident. Moreover all cars of the Bureau of Mines carry Red Cross first-aid books and supplies for instruction purposes. Several hundred Red Cross certificates of proficiency in first aid have been awarded during the year. The Bureau of Mines, the Y. M. C. A. and other organizations have contributed their part in fitting miners to take the examinations for these certificates.

demonstrations and contests be held in order to keep up the interest of the men. The Red Cross, profiting by its own experience and that of like organizations, has paid special attention to these public meetings. Among the contests for the year may be mentioned one at Roslyn, Wash., and others at Pittsburg, Penn., Inkerman, Penn., and Trinidad, Colo. Red Cross representatives have been present in the capacity of judges at all of these contests and Red Cross medals and certificates have been awarded to winners. In addition, other contests, notably one at Birmingham, Ala., have been supplied by the Red Cross with medals and certificates, local judges officiating. In each and all of these contests the Red

The Water Gage as Used in Mines

By Frank Lynde

Fig. 1 illustrates a sectional view of a breakthrough or crosscut between two entries, in which a water gage is hung on the brattice in order to determine the ventilating pressure at that point. To get accurate results the instrument must be hung vertically in a protected place where the air current is steady and does not strike the instrument directly. It should not be placed on a door in a crosscut or haulway, as there is always more or less leakage of air at doors, which would interfere with the correct reading of the instrument in such a position. Experience has shown that the observation is best taken in a stopped breakthrough or crosscut where the mine air is practically standing still and the oscillation of the water in the gage is reduced to a minimum.

If the instrument is inserted in a breakthrough or crosscut at the mouth of a split, the result so obtained applies only to that split and includes no other part of the mine. If, however, the gage is placed on the partition or brattice between the main intake and return, at or

Where water-gage readings should be taken in the mine. What the reading shows or represents. Description of the instrument and the three different scales that are used. Calculating the ventilating pressure and height of air column corresponding to any water-gage reading.

which illustrates a type of water gage often used in coal mines. One end of the tube is contracted and nearly closed to exclude dust. The other end, which is wide open, is extended and bent at a right angle so as to pass through a hole made in the brattice. The bend at the bottom, connecting the two arms of the gage, is made narrow so as to reduce the

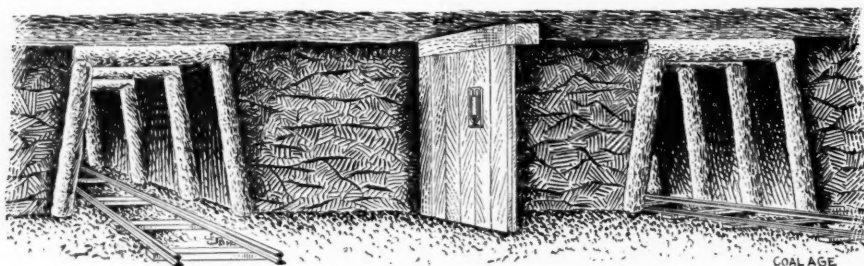


FIG. 1. SHOWING POSITION OF WATER GAGE ON BRATTICE BETWEEN INTAKE AND RETURN AIRWAYS

near the shaft bottom, the value of the water-gage reading obtained will apply to all the mine in by from this point. In order to obtain the reading for the entire mine, including the downcast and upcast shafts, the gage must be placed on the fan drift, in such a position as to show the difference of pressure between the fan drift and the outside air. This reading multiplied by the sectional area of the fan drift gives the entire resistance (pa) for the mine and the two shafts. There is a further resistance, due to the passage of the air current through the fan, but this resistance can only be estimated; it cannot be measured with the water gage, as there is no place where a reading could be taken that would represent the resistance offered by the fan to the passing air.

The water gage consists of a U-shaped glass tube open at both ends, and an adjustable scale by which the difference of the water levels in the two arms of the gage is measured. The whole is mounted on a wooden base as shown in Fig. 2,

oscillation in the water column. To the end of the left arm is cemented a brass tube, which can be inserted in a hole in the brattice when an observation is to be taken.

In the use of the water gage, the tube is first partly filled with water, which rises to the same vertical height, or water level, in the two arms of the gage as long as each arm is open to the same pressure. But, when the gage is placed in position on a brattice, separating the intake and return airways in a mine, through which an air current is passing, the intake pressure being always the greater, the water level sinks in the arm of the gage open to the intake, and rises an equal amount in the arm open to the return. The difference between these two water levels is measured, in inches, by the scale attached to the instrument.

There are three kinds of scales in use for reading water gages. It must be remembered that as the water level falls in one arm, it rises an equal amount in the other, so that the actual movement of

the water is but one-half of the difference in water level, which is the water column to be measured.

It is convenient to have a scale that, when adjusted, its zero marks the original water level, before there was any difference of pressure and the water stood at the same height in each arm. This is true in each of the scales shown in Fig. 2 and Fig. 3, respectively. These two scales must always be set or adjusted before the gage is placed in position, being careful that the instrument is truly vertical, as indicated by the small level or bubble tube, in the top of the gage.

The scale shown in Fig. 4, however, is adjusted after the gage is in place and the difference of pressure has caused a difference of water level. The zero of this scale is brought to correspond with

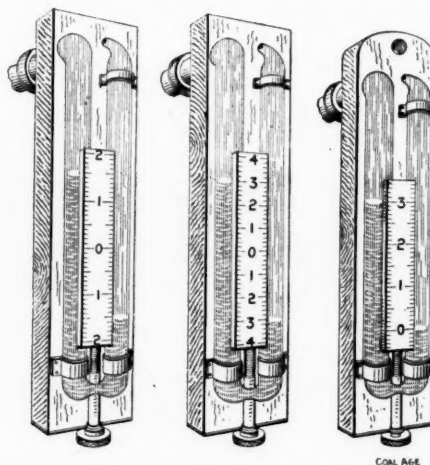


FIG. 2 FIG. 3 FIG. 4
MINE WATER GAGES—SHOWING THREE TYPES OF SCALES IN USE, EACH READING 3 INCHES

the lower water level and the upper water level is then read from the scale. This scale can only be graduated in full unit lengths (inches), as the full water column is measured directly on the scale by a single reading.

In Fig. 2 and Fig. 3, alike, the scale reads from zero both up and down, the reading of each water level being the same. These scales differ only in the fact that, in Fig. 2, the scale is graduated in full-length inches, and it is therefore necessary in reading this gage to add together the readings of the two levels; or, what is the same, double the reading of either level.

To avoid this necessity, the scale in Fig. 3, is graduated in half-length inches, so that the reading of either water level gives at once the true height of water column. In each of the three scales shown in Figs. 2, 3, and 4, the reading of the scale is 3 inches.

An improved form of water gage, manufactured by John Davis & Son, Baltimore, Md., and the American Safety Lamp and Mine Supply Company, Scranton, Penn., is provided with a small cock that is used to close the connection between the two arms of the gage. This device enables the water gage to be removed from the brattice and carried to a lighter or more convenient place for reading the scale. By closing the cock the water levels in the tubes are maintained at the height that marks the observation.

The surface of the water at the top of each column is not flat, but concave. This is because the water wets the glass readily and is drawn up all around the edge, forming a hollow in the center. To insure uniform accuracy, the scale should be read at the level of the bottom of this hollow, as illustrated in Fig. 5.

In mine ventilation, the ventilating pressure is expressed in pounds per square foot, and it is necessary to reduce the water-gage reading to that standard.

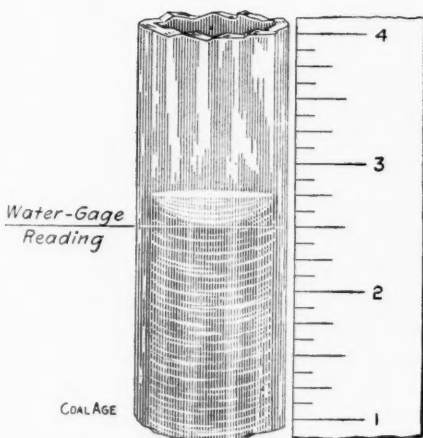


FIG. 5. SECTION OF WATER GAGE, SHOWING CORRECT MANNER OF READING CONCAVE SURFACE OF WATER COLUMN—READING 2.5 INCHES

One cubic foot of water weighs about 62.5 lb. The weight of a layer of water, one square foot, in horizontal section, and one inch deep, is then $62.5 \div 12 = 5.2$ lb. Hence, a water gage of 1 in. represents a pressure of 5.2 lb. per sq. ft. Therefore, to find the pressure corresponding to any given water-gage reading, multiply the reading, in inches of water gage, by 5.2; thus, a water-gage reading of 2.5 in. corresponds to a pressure of $2.5 \times 5.2 = 13$ lb. per sq. ft.

To reduce a water-gage reading, in inches, to the corresponding height of air column, in feet, it is necessary to multiply the gage reading, expressed in inches, by 68, because water is about 815 times as heavy as air at 60 deg. F. and 30 in. barometric pressure; and $815 \div 12 = 68$. For example, a water gage reading of 2.5 in. corresponds to an air column of $2.5 \times 68 = 170$ ft.

The Illinois Industry in 1911

SPECIAL CORRESPONDENCE

While the production figures for 1911 for Illinois will show a heavy tonnage, the profits to the operators have not been satisfactory. It has been simply a case of over-production, due to the opening of many new mines, and the increase of the productive capacity of existing mines. Many operators have installed electrical equipment, thereby enlarging their capacity while at the same time decreasing the cost of production. The consumption has been about on a level with industrial enterprises generally, which have been rather slow in this section.

HEAVY TONNAGE FROM A NEW FIELD

Aggressive development work has been carried on in the Franklin and Williamson county field. This district is a comparatively new one and was scarcely touched prior to 1904. It now has seven large producing companies; one shaft mine has a capacity of 3000 tons per day of eight hours. The heavy tonnage from this new field has naturally produced a demoralizing effect upon prices and explains in a measure the poor status of the coal trade in this vicinity during 1911.

The Chicago coal business usually amounts to about 30 million dollars per year, but during the past year abnormally high temperatures prevailed which have, no doubt, seriously decreased the average domestic consumption. In order to dispose of their product, the dealers have had to sacrifice values, and the natural result of this has been a series of price wars, which were felt in turn by the producers.

South of Chicago a number of new by-product plants have been constructed and others are in view. This industry is growing of considerable importance in this section.

Transfer of an Anthracite Line

The first change in the anthracite coal carrying lines for several years has been announced recently. It consists in the transfer of the controlling interest in the New York, Ontario and Western R.R. from the New York, New Haven & Hartford to the New York Central & Hudson River Co.; the consideration being partly in cash and partly in the controlling interest in the Rutland Railroad. While this change is not of the first importance it is rather an interesting transaction.

The New Haven bought its Ontario and Western stock seven years ago, partly to secure a supply of anthracite, and partly to supply traffic for its Poughkeepsie Bridge line, upon which it has spent a good deal of money; and partly, through

the use of this line to relieve the congestion at its Sound ports and on the lines running north from those ports. The Ontario and Western had been practically the only independent anthracite carrier; it controlled mines near Scranton, which produced about 5 per cent. of the total anthracite shipments, and it had not been particularly successful in its coal trade. The New Haven took a large part of its coal, using it to supply western and northern New England, but had little use for its western connections. The anthracite business of the road, however, was much improved in steadiness and in profit.

Control of the Ontario and Western by the New York Central gives it for the first time a line into the anthracite country, and a voice in the councils of the anthracite trade. Probably this is of less value to the Central than the settlement of some vexed questions relating to its West Shore line. It does not appear probable that the transaction will make any present difference in the course of the anthracite trade, whatever change may arise in the future.

Coal in Arizona

The extent of Arizona's coal resources was not appreciated until the publication of the results of the investigation of the U. S. Geological Survey, in 1911. The Black Mesa coal fields in the Hopi and Navajo Indian reservations are estimated to contain 8,000,000,000 tons of recoverable coal, and the Pinedale fields, Navajo County, although not surveyed, are known to contain important deposits, with two strata of coal, the upper 12 ft. thick, one half of which is of fair grade; the lower stratum, where examined, contains 2 to 3 ft. of good coal. Smaller fields of doubtful value are known in the Chiricahua Mountains, and near San Carlos.

Anthracite in 1911

The anthracite production for 1911 promises to far exceed that for any previous year. The shipments of anthracite for the first 11 months of 1911 were 63,838,872 long tons. The estimated shipments for December are approximately six million, making the total shipments for the year 69,838,872 long tons. The local trade for the year, including coal used at the mines, will be approximately 7,682,000. This will make the total production for the year 77,521,000 tons.

The output of coal from New South Wales has shown a decided improvement during the last year, and there has been an almost complete absence of the labor troubles which so hampered the industry during 1910. The output was estimated at 8,250,000 tons. In Victoria the output from the State coal mine was maintained at 300,000 tons per annum.

Pathogenic Mine Atmospheres—II

By Edwin M. Chance*

In the course of the following remarks, I shall attempt to discuss only those atmospheres which are likely to be met with in mines. From time to time terms applied by mining men to various atmospheres or constituents of an atmosphere may be used. It might, therefore, be well to define at once what these terms are intended to convey.

"Blackdamp" or "chokedamp" is the residual gas left after the partial or complete removal of the oxygen from the air. It is seldom found in a pure state, generally being mixed with proportions of normal air. In the pure state it may be roughly said to consist of from 85 per cent. to 99 per cent. of nitrogen, and from 1 per cent. to 15 per cent. of carbon dioxide. "Whitedamp" is the name given by miners to carbon monoxide. "Afterdamp" is a mixture of air, blackdamp, whitedamp, and carbon dioxide. It results from the explosion of mixtures of firedamp or coal dust and air, and when

The causes and conditions governing flame extinction and death by smothering. Such extinction of flame and asphyxia are due to the presence of oxygen in insufficient quantity to maintain the heat of flame or the vital processes and not to the presence of any other gases which are mere inert diluents of oxygen.

*Chief Chemist, Philadelphia & Reading Coal & Iron Co.

Note—Abstracted reprint from Journal of Franklin Institute, November, 1911.

of the gas burning. Professor Clowes has published a classic work on this subject, from which Table III has been taken.

THE PHYSICS OF FIRE EXTINCTION

Though much stress has been laid upon the extinction of a lamp flame by a vitiated atmosphere, the principal importance of the phenomenon lies in the warning it gives to the miner that there is danger of the air becoming so vitiated as to no longer support life. If we go further into the matter, however, this property becomes of paramount importance; instead of being a source of danger, it becomes one of the most efficient weapons at our disposal in fighting mine fires. In this connection it might be well to note a popular misconception of the *modus operandi* of the extinctive atmosphere. For some reason it is generally supposed that such an atmosphere has a quenching action similar to water upon a fire. This, of course, is not the case. As the percentage of oxygen in the air feeding a fire drops, the rate of combustion decreases, and with it the quantity of heat developed during a given time. Thus when a certain low percentage of oxygen is reached the rate of evolution of heat becomes less than the rate of loss of heat, the temperature of the burning body falling until a point is reached at which re-ignition cannot take place. At this point the fire is said to be extinguished. It will thus be seen that the time required to smother a fire by cutting off its air supply is as much dependent upon the mass of the burning material and the nature of the conducting material surrounding it as upon the composition of the air.

PHYSIOLOGIC ACTION OF OXYGEN

The general properties of oxygen are too well known to be given space here,

TABLE I. COMPOSITION OF BLACKDAMP

	O	N	CO ₂	CH ₄	Air	Black-damp	Fire-damp
1. Podmore Hall colliery, Haldane & Atkinson	1.45	82.56	10.64	5.35	6.94	87.71	5.35
2. Same, two months later	0.72	80.78	11.03	7.47	3.44	89.09	7.47
3. From anthracite mines, Chance	10.09	89.38	0.05	0.48	48.23	51.29	0.48
4. From anthracite mines, Chance	5.08	91.81	2.92	0.19	24.30	75.51	0.19
5. From anthracite mines, Chance	0.90	93.01	3.05	3.04	4.33	92.63	3.04
6. From anthracite mines, Chance	trace	94.79	2.68	2.53	trace	97.47	2.53

TABLE II. COMPOSITION OF FIREDAMP

	O	C _n H _{2n}	N	CO ₂	CH ₄	Air	Black-damp	Fire-damp
1. Gas from pipe in coal, Podmore Hall, Haldane & Atkinson	0.1	...	9.4	4.1	86.4	0.5	13.1	86.4
2. Garswood Hall, O'Shea	...	...	2.24	0.86	84.16	12.64	...	84.16
3. Garswood Hall, O'Shea	...	...	2.27	0.86	88.86	8.01	...	88.86
4. Accumulated gas at roof, U.S.G.S.	...	0.09	...	1.45	50.67	29.33	19.91	50.67

fresh is sometimes deeply colored by smoke or soot. "Firedamp" is a combustible gas composed principally of methane, but also containing small proportions of hydrogen, ethane and higher hydrocarbons. It always occurs mixed with varying amounts of oxygen, nitrogen and carbon dioxide.

In the past it has been customary to divide atmospheres into two classes: extinctive and non-extinctive. This classification, however, is purely arbitrary, being based upon the effect of the air upon the miner's lamp or candle. It is well known that, as the percentage of oxygen in an atmosphere falls, a point is reached at which the ordinary wick-fed flame is extinguished. If, however, the flame is gas-fed and burns from a jet, the point at which it will be extinguished is variable, depending entirely upon the nature

TABLE III. COMPOSITION OF THE RESIDUAL AND ARTIFICIAL ATMOSPHERES WHICH EXTINGUISH FLAMES, AND OF AIR EXPIRED FROM THE LUNGS

Combustible substances burnt	Percentage composition of the residual atmospheres in which the flame was extinguished			Proportions per cent. of O ₂ and N ₂ in which flame is extinguished when introduced	
	O ₂	N ₂	CO ₂	O ₂	N ₂
I					
Alcohol, absolute	14.9	80.7	4.35	16.6	83.4
Alcohol, methylated	15.6	80.25	4.14	17.2	82.8
Paraffin lamp oil	16.6	80.4	3.0	16.2	83.8
Colza and paraffin	16.4	80.5	3.1	16.4	83.6
Candle	15.7	81.1	3.2	16.4	83.6
II					
Hydrogen	5.5	94.5	...	6.3	93.7
Carbon monoxide	13.35	74.4	12.25	15.1	84.9
Methane	15.6	82.1	2.3	17.4	82.6
Ethylene	...	...	...	13.2	86.8
Coal gas	11.35	83.75	4.9	11.3	88.7
III					
Expired air (average)	16.15	79.9	3.95	...	...
Fresh air (average)	20.9	79.06	0.04	...	...

though a few words may be devoted to its action on man. The mechanics of the absorption of oxygen by the hemoglobin, and its distribution through the tissues by this medium, is well understood. Normally the human organism is supposed to operate on air containing about 21 per cent. of oxygen. It is remarkable, however, how adaptable this organism is to divergences from this percentage. For some reason general credence has been given to the statement that if air rich in oxygen be breathed for any length of time an exhilaration will be experienced which, if the inhalation be continued, will verge into a delirium resembling alcoholic intoxication. Prof. Leonard Hill, quoting the work of Bornstein, Lorain Smith, J. J. R. Macleod, and himself, states that concentration of oxygen up to 100 per cent. can be borne for long periods without ill effect. The writer has personally administered fairly pure oxygen to men many hundreds of times, and has in no case observed any disturbance of function in the subject.

A DEFICIENCY OF OXYGEN

The question of the effect of an insufficiency of oxygen has been ably treated by Haldane and Lorain Smith. These phenomena, however, are generally considered under the action of blackdamp and firedamp, but as both these gases are inert their effects are largely due to the lack of oxygen which they displace. At times a deficiency of oxygen may arise, either from underground fires or, in the absence of fire, from the direct combination of the atmospheric oxygen with the constituents of the coal. Haldane states that "a person not exerting himself will not as a rule notice anything unusual until the oxygen percentage has fallen to 10 per cent. The breathing then usually begins to become deeper and more frequent, the pulse more frequent, and the face somewhat dusky. At 7 per cent. there is usually distinct panting, accompanied by palpitations, and the face becomes of a leaden-blue color. At the same time the mind becomes confused and the senses dulled, although the person breathing the air may be quite unaware of the fact. Muscular power is also greatly impaired. At a slightly lower percentage there is complete loss of consciousness."

Virtually the same statements appear so frequently in the literature that they may be considered to be authoritative. The writer has had the opportunity of witnessing several cases of asphyxia induced by exposure to blackdamp and firedamp. He has also discussed the matter with many experienced miners who have undergone the same unpleasant ordeal, and there seems to be no doubt that, in addition to the symptoms described above, there is considerable nausea and severe headache, coupled

with great lassitude. It must be borne in mind, in discussing the physiological action of a mine atmosphere, that the effect noticed is seldom, if ever, traceable to a single gas, but is the resultant of the effects caused by its various components.

CARBONIC DIOXIDE MAINLY DILUTES OXYGEN

Carbon dioxide is a constant constituent of mine atmospheres. Its presence is traceable to various sources. The most important of these is the coal itself. At ordinary temperatures atmospheric oxygen slowly oxidizes the coal, producing carbon dioxide as one of the products of this oxidation. The respiration of men and animals and the combustion of miners' lamps or candles are less important sources of this gas.

Much stress has been laid in the literature upon the toxicity of carbon dioxide. Though under certain conditions the gas possesses undoubtedly toxic properties, it would seem that in the vast majority of cases the damage done by insufficiency of oxygen has been laid at the door of carbon dioxide. Indeed, there seems to be considerable confusion on this point in the minds of many writers. We read of men being overcome by carbon dioxide when descending into wells, old shafts, or ill-ventilated parts of a mine. In truth, it is difficult to conceive of an atmosphere, barring one synthetically prepared, in which there could be a lethal percentage of carbon dioxide and at the same time sufficient oxygen to support life. It is more reasonable to believe that a primary insufficiency of oxygen in these cases is made more deadly by the carbon dioxide associated with it.

HOW WE BREATHE

In discussing its physiological action, reference must again be made to the classic work of Dr. Haldane, who has described with clarity and elegance the mechanics of the metabolism of this gas. Indeed, the matter has been so ably treated that the writer can do no better than to quote from this authority:

"Mr. Priestley and the writer have shown that at ordinary atmospheric pressure the breathing always regulates itself in such a way as to keep the percentage of carbonic acid in the air cells (alveoli) of the lungs constant. Each individual has his own exact percentage; but on an average there is about 5.6 per cent. of carbonic acid in the alveolar air of man. The regulation is almost astoundingly exact for each person.

"If air containing carbonic acid is breathed, the respirations become deeper, in such a way that the alveolar carbonic acid percentage still remains practically the same, if possible. If, for instance, there is 2 per cent. of carbonic acid in the air, the breathing will need to be about 50 per cent. deeper than before.

This difference would not be noticed by the person, but is easily detected by measurement. If there is 5 per cent. of carbonic acid in the air, it requires much panting to keep the alveolar carbonic-acid percentage nearly constant; if there is 6 or 7 per cent., it is, of course, quite impossible to maintain a normal alveolar carbonic-acid percentage, and great distress is produced, as the blood becomes abnormally charged with carbonic acid, to which the body is exquisitely sensitive. If breathing of ordinary pure air is forced, so that the carbonic-acid percentage in the alveolar air is abnormally reduced, natural breathing is afterward suspended for a short time, the condition known as apnoea being produced. It is carbonic acid, and carbonic acid alone, which regulates our breathing under normal conditions. The supposed ill effects of a small percentage of carbonic acid in the inspired air are wholly imaginary, as a very slight increase in the depth of breathing at once compensates for the extra carbonic acid. Provided that this compensatory effort is practically inappreciable, we may wholly disregard it. To any moderate variations in the oxygen percentage of the inspired or alveolar air there is no corresponding physiological response.

Thirkell has tabulated the action of carbon dioxide as follows:

TABLE IV

Percent- age of Carbon Dioxide	Effects on Man	Effects on Lights
3.5	Breathing deeper	Still burns
6.0	Marked panting	Still burns
10.0	Severe distress	Still burns
15.0	Partial loss of consciousness	Extinguished
25.0	Final death	Extinguished

He fails to state, however, whether the percentages of carbon dioxide noted were added to an atmosphere of normal composition or were produced by combustion. It is evident, from an inspection of the table, that the former hypothesis is the more likely. The consideration of these data may be aided by the statement that the author has analyzed many samples of anthracite mine air, containing from a trace to 10 per cent. of oxygen, in which the carbon dioxide never exceeded 5 per cent.

EFFECT OF METHANE

Methane, the principal constituent of firedamp, is never found in the pure state. Beside the other components of an atmosphere, it is now generally conceded that it is accompanied by small proportions of higher hydrocarbons of the same, and unsaturated series. As these other hydrocarbons exert but little influence upon the properties of methane, their presence is more of academic than real interest. The gas is colorless, odorless, and lighter than air. Dickson and Coward give its ignition temperature in air at from 650°

to 750° C. Air containing from 5 per cent. to 16 per cent. of methane will explode on ignition, though outside of these limits it may be dangerous because of its inflammability. It has been conclusively shown that methane finds its way into the air of a mine not only from reservoirs of the gas under pressure, but also more gradually from the coal substance itself. Though, as already pointed out, methane has in itself no physiological action, its indirect effect upon man through the dilution of oxygen which it brings about may be thus indicated:

TABLE V		
Percentage of Fire-camp	Effects on Man	Effects on Lights
1.0	Nil	First indication of a cap
2.0	Nil	Well-formed cap
5.5	Nil	Lamp fires and goes out
45.0	Breathing slightly deeper	Lamp fires and goes out
70.0	Life endangered	Lamp fires and goes out

An excess of nitrogen in mine air is due principally to the abstraction of oxygen by oxidizable substances. Blackdamp of this variety is distinguished by its lightness, being found in cavities as

is firedamp. It is sometimes designated as "light air."

TABLE VI		
Percentage of blackdamp	Effects on Man	Effects on Lights
16	Nil	Extinguished
28	Breathing slightly deeper	Extinguished
50	Severe panting	Extinguished
66	Life endangered	Extinguished

In the preceding table "blackdamp" is to be considered as a mixture of 87 per cent. of nitrogen and 13 per cent. of carbon dioxide.

Blackdamp, like methane, is inert physiologically, acting merely as a diluent.

Larger Coal Mining Catastrophes

By R. Dawson Hall

It is too early to make any estimate of the number of men, who have met death in all kinds of accidents connected with the coal-mining industry in the year which has just passed. It may be hoped that the individual fatalities and accidents will show a slight reduction. Certain it is that the larger catastrophes have been fewer in number and far less severe than in the immediately previous years.

It is not safe at present to ascribe a reason for this reduction, but if the decrease continues we may well assume it to be due to greater precaution. A single year cannot be regarded as a criterion. But it is nevertheless a reasonable cause for no moderate rejoicing that the fatalities from explosions and mine fires, though still too numerous, have fallen in one year from 1207 to about 487, an exact reduction of 60 per cent.

The table only covers the explosions where more than one man was killed or

Fatalities in mine explosions and fires reduced 60 per cent. this year, but the United States fatalities only declined 22 per cent., the deaths in the rest of the world dropping 87 per cent. English and Mexican death roll is small compared with that of 1910.

usually heavy, 136 persons being killed at the Whitehaven pit on May 11 and 344 in the terrible disaster at the Little Hulton pit on Dec. 21. Mexico also in 1910 had two severe explosions, both at Palau mines, Los Esperanzas,

87 per cent. from 1910 to 1911. Higher in 1910 by 40 per cent. than in the United States; in 1911 it is about one-fourth as large.

ACCIDENTS IN 1910 AND 1911

Our worst accident in 1910 was that on May 5 at No. 3 Palos in Birmingham, Ala., where 80 men were killed. Primero, Colo., Jan. 31, was the next most serious fatality. Here 75 men lost their lives. Starkville, Oct. 8, comes next with 56. Delagua, Calif., Nov. 8, with 45. Mulga, Ala. April 21, with 39, Browder, Ky., Feb. 1, with 34. The rest it is not necessary to mention. Unfortunately we have had two more numerous fatal catastrophes in 1911, but the roster, though it has more significant names, is not so long. Heading it, is the Banner mine near Birmingham, Ala., which on April 8 snuffed out 128 lives. The Briceville explosion is too recent to re-

TABLE OF DEATHS FROM LARGER MINE EXPLOSIONS AND FIRES

Years	DOMESTIC						FOREIGN						WORLD					
	Explosions		Fires		Totals		Explosions		Fires		Totals		Explosions		Fires		Totals	
	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths
1909	22	250	2	265	24	515	6	359*	0	0	6	359*	28	609*	2	265	30	874*
1910	22	501	0	0	22	501	9	704	1	2	10	706	31	1205	1	2	32	1207
1911	13	318	2	78	15	396	5	86	1	5	6	91	18	404	3	83	21	487

*Does not include deaths at Belmez Mines.

injured. Whilst quite reliable as regards the domestic fatalities, some may well be missing from the foreign list. The report of the Belmez mine disaster in Spain, July 11th, 1909, showed 700 men killed and this has not been confirmed. Coming from a country where information is usually withheld in cases such as these, it is probable that the extent of the accident was much exaggerated. The item is omitted in all the summaries. It will be seen that the foreign casualties for 1911 show even a greater reduction than those of the United States. The English casualties in 1910 were un-

Coahuila, Mex. In the first, Feb. 2, 57 persons were killed. The second cost on Oct. 3, 70 lives. The Cerro de Pasco disaster in Peru, on Aug. 2, resulted in the loss of 60 lives. On the other hand there were no foreign explosions of like severity in 1911. The worst was one in January at the Casimir mine, Sosnowice in Russian Poland resulting in 40 casualties, while one at Bardot in France reaped a harvest of 26. Lamentable as these two calamities were they pale before the Little Hulton explosion of the year before. The foreign death roll from mine explosions and fires has shrunk

quire mention. On Dec. 9 the Cross Mountain mine at Briceville exploded and on that and succeeding days, in all 84 men succumbed. One more leading catastrophe and the list of major disasters in last year's mining ends. At the Price Pancoast mine, Throop, Penn., April 7, 73 men including one of the rescue force were killed as the result of a mine fire. All that follow are less important than the Sykesville explosion, July 15, when 21 were killed. The percentage of reduction for 1911 over the leading domestic fatalities of the preceding year is 22.3%.

Cost Sheets and Daily Reports

It is of great importance in the proper management of a coal mine that some system be adopted whereby those in authority can tell just what is going on without wading through a miscellaneous collection of letters and reports. General superintendents and managers in charge of a number of properties feel the imperative need of some system of reporting tonnages and costs in a clear and concise form. It is not possible for the man at headquarters, in charge of a number of mines, to find the time or opportunity to be in actual daily touch with the details of each mine. Yet he must know and be familiar with many of the details, since the most trivial matter in a coal mine may suddenly become the most serious.

REPORT SHOWING CAUSES OF RESTRICTED TONNAGE

Fig. 4 is a form designed to give a concentrated report on the number of tons hoisted, the men working and the time lost at all the company's mines, and shows at a glance whether or not the mine made its normal tonnage, and if not, why not. It is to be understood, of

By John A. Garcia*

Forms of accounts suited to assist in keeping before the manager's eye the salient points as to volume and character of daily output, and the various cost items entering into production.

*Mining engineer, Allen & Garcia Co., McCormick Building, Chicago, Ill.

course, that any serious trouble at the mines should always be reported by telegraph or long-distance 'phone, and such matters be entered into the reports only as a matter of record. The cause of the different delays, as shown on this form, are tabulated on another sheet in a loose-leaf book, and if there is any chronic trouble at the mine, such as a cage breakdown, cars in sump, motor wreck, etc., this tabulation gives mute evidence of the failure either of the equipment or of the men in local charge.

DAILY COST SHEET

The second form to pass before the manager in his morning quest for information is Fig. 1, which gives a fairly accurate figure on total cost per ton for the day's hoist, and a statement in detail, which will readily show cause for any marked increase in costs. The yardage figure on this statement is based on cost per ton for previous month, and is usually accurate within 1/2c., and the cost of material used is taken from the storehouse record, which is totaled at the end of the work each day by the clerk in charge and entered into the daily cost sheets.

The various grades of coal produced are also shown on this form and from these figures can be readily calculated the percentages of screenings, lump and small-sized coal. The number of kegs of powder sold each day is entered on this sheet and any marked increase in percentages of screenings, on account of heavy shooting, may be readily detected by reducing these figures to tons of coal per keg of powder.

To anyone familiar with the ordinary routine work in and about the mines,

COAL COMPANY

Daily Estimate of Expenses and Local Earnings of Mine No.91....

OPERATING EXPENSES							
Outside	No.	Amount	Inside	No.	Amount	Inside (Continued)	Amount
Local office			Pit boss			BROUGHT FORWARD	
Mine office			Pit boss assistant			Tail rope engineer	
Top boss			Boss driver			Trip rider	
Engineers—day			Mine examiners			Shot firers	
Engineers—night			Single drivers			Fire runners	
Firemen—day			Spike team drivers			Labor on surveys	
Firemen—night			Dead work—day			Other labor	
Ash wheeler			Dead work—night			Material used	
Blacksmiths			Tracklayers			TOTAL INSIDE	
Trimmers			Jackmen			SUMMARY	Amount
Dock boss			Timber men			Outside expense	
Carpenters			Cagers			Inside expense	
Stablemen			Handling empties			General expense	
Weighmen			Pumpers			Yardage and room turning	
R. R. car weighman			Trappers			Production	tons @
Watchman			Cleaning roads			Total operating expenses	
Teamsters			Spraggers			Cost per ton of mine run	
Dumpers			Pick carriers			Mine worked	hours
Bit sharpening			Bratticemen			Additions and betterments	
Loaded car runner			Greasers			Labor	
Empty car runner			Couplers			Material	
Car repairer			Water hauling			Total	
Check puller			Electrician			LOCAL EARNINGS	Amount
Handling rock			Electrician's helper			Retail coal	
Roostabout			Machine runners—day			Rents	
Pox car loaderman			Machine helpers—day			Material	
Machinist			Machine runners—ton			Powder	
Material used			Machine helpers—ton			Store commissions	
			Loaders			Miscellaneous	
			Rolls			TOTAL LOCAL EARNINGS	
			Room examiner				
			Motorman				
TOTAL			CARRIED FORWARD				

PRODUCTION

	Tons
Lump	
Egg	
Mine run	
No. 1 nut	
No. 2 nut	
Screenings	
TOTAL	

STORE CHECKS ISSUED, \$.....

POWDER SOLD, KEGS, \$.....

COAL USED IN BOILERS, TONS.....

REMARKS.....

Superintendent

FIG. 1. DAILY ESTIMATE OF EXPENSES AND LOCAL EARNINGS

trouble of almost any sort is indicated at once on this daily cost sheet, the cost charged against different labor classifications increasing if some condition arises requiring prompt repair, such as cleaning roads or track-laying. In the case of low tonnage account from shortage of drivers, motormen, etc., the reason for increase in cost or decrease in tonnage is at once apparent.

Without a first-hand knowledge of actual conditions in the mines, gained from repeated inspection and periodical trips, this statement, or any other, in fact, designed to keep one in daily touch with the properties, is more or less a failure, for reasons too apparent for elaboration here; it is sufficient to say that no man can manage property by continued use of the "absent treatment."

MONTHLY COST SHEET

Fig. 2 is a condensed, accurate and official statement of costs for the operating department, to be furnished each superintendent, so that he may discuss each item of special interest with his subordinates. This statement is furnished at the end of each calendar month, or as soon thereafter as the pay roll can be worked up, and shows both labor and material costs and all charges over which the operating department has control, and is, therefore, called "operating cost per ton." The charges for royalty, selling cost, depreciation, etc., are added on the cost sheet prepared for executive officials. A summary of costs for different classifications, as inside labor, outside expense, general mine expense, is given at the bottom of the sheet, not only for this month, but for last month and for the same month of the previous year. A careful study of this cost sheet will indicate where interest should be centered and what particular items need attention and the inspection trip which generally follows, brings about the desired results or satisfactory reasons for the contrary.

COMPARATIVE COST SHEET

Fig. 3 is a statement gotten up in condensed form for a small loose-leaf book, to be carried in the manager's pocket or bag, and gives comparative costs at different mines. It is interesting and instructive to compare the different labor and material costs of mines in various sections of the country, working under different physical conditions and various labor and material scales, yet on this account the value of the figures from a comparative standpoint is limited.

Form shown as Fig. 5 is given merely to show how the company tries to check each day the tonnage paid for and tons sold, but on account of the variation in hopper and track-scale weights, the check is only approximate, but has proved close enough for all practical purposes, especially when the track scales are under the

tipple and part loads may be actually weighed.

The labor of working up the daily re-

ports is practically nothing if done in a systematic manner, for all the information shown thereon is put down in some

COAL COMPANY					
Cost of Coal Produced at Mine No. in 19..					
INSIDE LABOR	Amount	Cost per Ton	OUTSIDE LABOR	Amount	Cost per Ton
Digging.....Tons			Engineers and firemen.....		
Room turning.....			Weighman.....		
Yardage.....			Trimmers.....		
Timbering.....			Teamsters.....		
Track laying.....			Stable boss.....		
Driving.....			Top boss.....		
Caging and spragging.....			Dumpers.....		
Trapping.....			Carpenters.....		
Coupling and greasing.....			Smithing.....		
Roadmen.....			Machinist.....		
Water bailing.....			Top men.....		
Pit boss and assistant.....			Dock boss.....		
Night boss.....			Check puller.....		
Dead work.....			Bit sharpener.....		
Motormen.....			Car repairer.....		
Trip rider.....			Miscellaneous labor.....		
Inspector.....					
Jerry men.....			TOTAL.....		
Electrician.....					
Bratticeman.....			OUTSIDE EXPENSE		
Pumpman.....			Fuel.....		
Rolls.....			Oil and waste.....		
Shot firers.....			Maintenance machinery.....		
Fire hunters.....			Maintenance ordinary.....		
Machine boss.....			Stable.....		
Room examiner.....			Miscellaneous.....		
TOTAL.....			TOTAL.....		
INSIDE EXPENSE			GENERAL MINE EXPENSE		
Timber.....			Superintendents and clerks.....		
Powder and dynamite.....			Office expenses.....		
Royalty.....			Insurance.....		
Miscellaneous.....			Miscellaneous.....		
Maintenance machinery.....			Engineering Dept.....		
Ties and tracking.....					
Oil and waste.....			TOTAL.....		
TOTAL.....					
RECAPITULATION			THIS MONTH	LAST MONTH	LAST YEAR
Total tons.....					
Total inside labor.....					
Total inside expense.....					
Total outside labor.....					
Total outside expense.....					
Total general mine expense.....					
Total operating cost.....					
Operating cost per ton.....					

FIG. 2. COST OF COAL PRODUCED

COAL COMPANY						
Summary of Costs of Production for 19..						
Mine.....						
Day's run.....						
Tons produced.....						
Maximum daily output.....						
Average daily output.....						
Cost per ton.....						
Mining.....						
Yardage and room turning.....						
Driving.....						
Other inside labor.....						
Preparing and shipping.....						
Other outside labor.....						
Total company labor.....						
Timbers.....						
Supplies.....						
Fuel.....						
Superintendents and clerks.....						
A. & B. charged to operations.....						
Royalty.....						
General office.....						
Total cost.....						
Revenue per ton.....						
Profits per ton.....						
Profits amount.....						

REMARKS:

FIG. 3. SUMMARY OF COSTS OF PRODUCTION

book or on some sheet each day, and may often be placed on these sheets direct without the labor of transcribing.

Innumerable items modify the cost of coal, many of which are beyond control. Such are idle days resulting from an inactive market or from the irregular delivery of cars by the railroad. Strikes and shutdowns are frequent in Illinois and Indiana, and the delays due to these increase the cost of coal inordinately. Not only is loss sustained from the carrying of fixed charges over periods of rest, but also from the permanent damage to the property. Moreover, there is a continued maintenance cost in sections of the mine injured by the forced neglect

..... COAL CO.
.....191..

DAILY TONNAGE REPORT

[illegible]

REMARKS

FIG. 4. DAILY TONNAGE REPORT

COAL COMPANY

Coal Report—Mine No.....191..

PRODUCTION	TONS	
On hand this a.m.—mine-run		
On hand this a.m.—lump		
On hand this a.m.—egg		
On hand this a.m.—nut		
On hand this a.m.—screenings		
TODAY'S BULLETIN:		
Including cars without checks		
Including company coal		
Excluding cars reclaimed		
TOTAL		
DISPOSITION		
Loaded on cars		
Wagon and boiler coal		
Left over—mine-run		
Left over—lump		
Left over—egg		
Left over—nut		
Left over—screenings		
TOTAL		
Production—over—short		

FIG. 5. COAL REPORT

which results from repeated interruptions to industry. For these many reasons, records of cost and of tons hoisted and statements on the "per man" or "per mile" basis are practically of no value. I believe the forms here shown are suffi-

cient to keep a man well informed regarding the daily costs and economical conditions at his mine.

A Relay Controller for Electric Mine Haulage

SPECIAL CORRESPONDENCE

As the use of electric power for mining operations has increased, and confidence in this method of operation become greater, the sizes of electric haulages have been increased, until today some decidedly large equipments are in successful operation. As the size of equipments increased, however, the problems connected with the rapid and easy handling of the electric current required, became more pronounced, and the ingenuity of the manufacturer has been called into play in order to meet the demands of the situation. In line with these demands a relay controller has recently been de-

DESCRIPTION OF THE CONTROLLER

Although the following description refers particularly to the haulage-engine controller here illustrated, the greater part of it is equally applicable to relay controllers for other purposes. The main controller consists of six separate relay switches or "contactors" and a relay reverser, all operated by solenoids which are excited by small relay currents. These relay currents are operated from a small master controller placed conveniently near the brake levers of the haulage engine. The main controller and its resistances can be placed out of the way against any wall not too far away from the point of entry of the mains.

Each contactor consists of a horizontal iron-frame solenoid, the plunger of which is linked to a hinged cast-iron frame carrying a laminated-copper brush, the electrical contact being made when the latter is slewed inward and presses

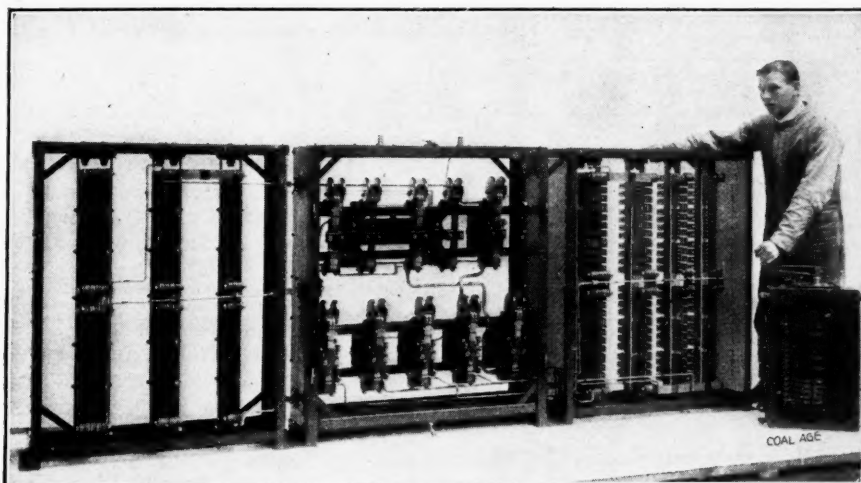


FIG. 1. RELAY CONTROLLER FOR ELECTRIC MINE HAULAGE

signed by Messrs. Laurence, Scott & Co., of Norwich, England, which possesses many features of interest.

The particular controller illustrated in Fig. 1 was one of a number made to replace barrel controllers of various makes on inclined haulages in a large group of mines. The duty varied from 100 to 200 h.p. at 500 volts. The same standard type of controller with various modifications has been supplied for a number of different purposes where heavy duty had to be met, either in the frequency of use or the heaviness of the current to be controlled.

For all such work as capstans, haulage engines and car hoists, as well as automatic equipments for large air compressors and hydraulic pumps in mines, it has been found that the life of a relay controller is much longer than that of a barrel controller, and that for any current over 100 or 200 amp. it will save its cost in a few years, besides requiring less attention.

against suitably shaped copper blocks above and below its axis. Although there are two areas of contact, the current is only broken at one point, that is, at the top of the brush, while the bottom of the brush (being closer to the axis about which the brush frame swings) only slacks off its contact sufficiently to ease the spring tension of the leaves.

The reverser consists of two solenoid-operated relay switches as above described, each with double brushes, and interlocked by a swinging bar which prevents both relays from pulling in at once should they, by any chance, be simultaneously excited. All the relay switches are mounted in a roomy case on iron bars. The connections are all of stiff bare copper rod and are accessible from the front.

The master controller is of the barrel or street-car type, and though it has to carry only small currents it is made mechanically robust to stand rough handling. The barrel castings are made in halves,

and clamped onto a square spindle over sheet micanite wrapping. The actual contacts on the barrels are made of sections of copper tube $\frac{1}{4}$ in. thick, fixed by screws to the central castings after the latter have been machined on their own spindle. The castings carrying the contact fingers are clamped in place on two iron bars insulated with long micanite troughs. The whole of the control gear is constructed on the "metal and mica" principle.

OPERATION OF THE CONTROLLER

The action of the switching apparatus can best be seen from the diagram in Fig. 2. In the present case no special "fool-proof" devices were needed, as the

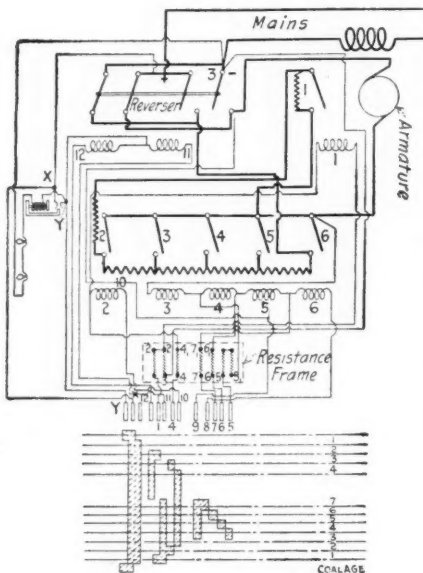


FIG. 2. DIAGRAM OF CONTROLLER CONNECTIONS

motors were series wound and did not overload themselves seriously if started more quickly than normal. The only retarding effect on the first three steps is obtained by the cam of the master controller, which prevents the operator from running straight over. The relay circuits for these contactors (reverser and 1 and 2) are connected straight across the mains (through the "no-volt"). The remaining relay circuits are connected across the armature and set to pull in at different voltages. The result of this is that if the operator switches over too quickly on his master controller, relays 3, 4, 5 and 6 will not come in till the motor starts, and they will then come in in turn as the motor gathers speed.

To avoid winding with very fine wire, the relay coils are arranged in two sets in series, and the master controller inserts substitutional resistance when a coil is out so as to keep the relay current constant. The left-hand portion of the master barrel on the diagram deals with the "no-volt," the middle part with relays

1, 2 and reverser, across the mains, and the right-hand part with the remaining relays across the brushes; the blank contact was intended for a solenoid brake if required.

The arrangement is, therefore, a most compact and easily handled device, making for simplicity and ease in operation. It is so constructed that the danger of breakdown is very remote and its interest to mining engineers in all locations where electricity is used for large powers is, therefore, obvious.

British Columbia Coal Industry in 1911

BY E. JACOBS

Leaving out of consideration the especially unfavorable conditions that prevailed in the Crow's Nest Pass district during eight months of the year just closed, the coal-mining industry of British Columbia may be said to have flourished. However, as a matter of fact the strike of the coal-mine and coke-oven employees, which lasted from the end of March until practically the end of November, enforced a suspension of production at some of the largest operations in the province, notably the collieries of the Crow's Nest Pass Coal Mining Co., the Hosmer Mines, Ltd., and the Corbin Coal & Coke Co.

The total quantity of coal produced in 1910 at the mines of the several companies mentioned above, was 1,365,000 long tons. Of this amount, 335,000 tons were made into coke, and the net output of coal was, therefore, 1,030,000 long tons. In addition to the coal produced, 216,000 tons of coke were made. The total value of these products, as shown in the official records, is \$4,900,000.

Since the larger producers have been idle practically two-thirds of the year 1911, a rough estimate of the production for the past 12 months may be placed at one-third of that for 1910; that is, about 350,000 long tons of coal and 70,000 tons of coke, which, together, will have a value of \$1,645,000, calculated at prices which are officially used. This shows a decrease of \$3,256,000 from the value of the output for the previous year.

The output from the Vancouver Island coal mines was larger in 1911 than in 1910. In the absence of statistics the production may be placed at about 1,750,000 tons, as against 1,616,000 tons in the previous year. This represents an increase in value of about \$455,000, after allowing for the nonproduction of coke, and the net decrease in value of coal and coke for the whole province of British Columbia may, therefore, be stated as \$2,801,000.

The Crow's Nest Pass Coal Co., at its Coal Creek colliery, recently

opened three or four new mines, from which a comparatively large tonnage of excellent coal will be derived. A gravity tramway on the surface provides for carrying the coal of these mines to the main tippie. At the company's Carbonado colliery, further prospecting has led to the hope that mines can possibly be opened there in ground where the structure of the seams is the most favorable; and furthermore, several new seams have been discovered.

At Hosmer another level has been established along the outcrop of the coal seam, about 500 ft. above the level of the main entry of the mine. An auxiliary incline, following the contour of the mountain, provides for transportation of the coal down the main incline and thence to the tippie.

At Corbin an enormous deposit of coal has been opened at the surface, and preparations made for working this deposit opencast, like a quarry. At Princeton, Similkameen, the output of the small colliery there has been substantially increased, and higher up the Tulameen River a new mine has been opened.

In the Nicola district, the Nicola Valley Coal & Coke Co. has built a new tippie and other plants, has improved the outlets from its mines and has located important extensions of its coal deposits.

On Vancouver Island the Canadian Collieries (Dunsmuir), Ltd., has let contracts in connection with the development of a hydro-electric power plant. The water line for this project will be about three miles long and 11,000 h.p. will be developed for use chiefly at the company's Union colliery, in the Corux district. Also, a new shaft is being sunk to a depth of about 1000 ft., but it will be from 12 to 18 months before coal is mined at this point. The Pacific Coast Coal Mines, Ltd., has increased the production of its Fiddick colliery and continues development work at Suquash. The Vancouver-Nanaimo Coal Mining Co., Ltd., is providing for shipping facilities at tidewater and for the erection of a plant and machinery at its New East Wellington colliery.

Prospecting for coal lands was continued on the Graham Island of the Queen Charlotte group during the year; also at the head waters of the Telkwa and Morrice Rivers, in the Skeena district, and in other parts of the province. Probably the most important development of the year, as regards new fields, was one with which James McEvoy, of Toronto, Ont., is actively associated. The area secured by Mr. McEvoy's principals, is 16 square miles. The coal is reported to be anthracite of excellent quality and available in large quantities. This new field is described as being located at the head waters of the Skeena River, about 120 miles north of the town of Hazelton, B. C.

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COAL AGE

Looking Ahead to April 1

To some ways of thinking, it no doubt seems a rather far cry to Apr. 1, but from at least one point of view, that date looms up near and large. It is only necessary to consult the daily press to realize how thoroughly the question of a comprehensive strike in the coal industry has emerged from the realm of discomfiting speculation and taken on the proportions of an important and impending issue.

During the next two or three months, the usual sparring for position may be expected from the several parties to this industrial controversy; there will be a few tentative demands, and some proffered compromises, but the real magnitude and dimensions of the situation will not become fully apparent until the workmen, by taking some final stand, indicate the strength of their convictions as to what they believe to be their essential needs, and reveal the intensity of purpose which rests in their counselors and leaders.

In the bituminous fields where the miners' union is generally established and recognized, the demands of the men will doubtless involve some matters of more or less purely local import, but will, in the main, center around a desired increase in wages. In the anthracite field, beside the demand for an advance in pay, provisions for recognition of the union will probably receive equal emphasis if not equal support.

The unsatisfactory condition of the bituminous-coal business in many localities during the year just past, the inauspicious outlook for an immediate betterment of this condition, and the avowed attitude of a number of operators throughout the country, do not at all lend probability to the idea that an increased cost for labor will be accepted readily in this branch of the mining industry.

The controlling factor in the situation is the existence of fields that are at once large producers and employers of comparatively inexpensive nonunion labor.

Thus the operators of Ohio and western Pennsylvania are already hard pressed to meet the competition of West Virginia and other unorganized southern districts, and it would seem altogether out of the question for them to add anything to their present cost of mining. Illinois and Indiana operators in turn, may well be loath to grant an advance in wages that is not paralleled in Pennsylvania and Ohio. Present indications are that concerted interstate action will not be taken in regard to the new agreements, but that each field will have to settle the matter largely for itself, Pennsylvania taking the lead.

Concerted action may always be looked for, however, in the anthracite region. While only a small proportion of the 180,000 mine workers of this section are permanently affiliated with the union, the whole number can usually be relied on to lay down their tools and strike, if the probable advantage of such a move is made sufficiently evident to them; and the operators of this area are well known to be closely allied and to act in unison on all matters of general concern.

While the formal demands of the anthracite miners will not be made until after their annual convention, the important points to which they are already committed may be easily divided into those which involve the established recognition of the union, and those that are designed to secure the support of the large majority of workers who are not ordinarily among its active adherents.

So far as an increase of wages and an eight-hour working day are concerned, the demands will be assured not only of the hearty indorsement of every workman in the field, but there would also seem to be a fair chance of such compromises being made in conference with their employers as would effect a satisfactory settlement, although the operators will doubtless insist strongly on a renewal of the present agreement as it stands.

However, if the provisions for recognition of the union, involving as they do

both the introduction of the check-off system and the abolition of the conciliation board, are so successfully interwoven with the popular appeal for higher pay as to induce the workmen to present a solid front in demanding both of these, then a long and bitter struggle may be predicted, because the determination of the operators to maintain the principles of the open shop is well known to be fixed and unrelenting.

The large anthracite-coal companies directly own or control storage plants of easily seven million tons total capacity. These are reported to be well filled at present and will beyond doubt be stocked to the limit before the end of March. It would seem that all possible provisions are being made for reclaiming coal from the colliery waste banks—a process that furnishes a considerable quantity of the smaller sizes and does not involve the operation of the mines. Not a little steam coal is being stocked for the use of colliery boiler plants and more than usual care and activity are evident in the setting off of company property by substantial board fences. In short, it looks as though the operators not only fear trouble, but expect it.

Electrical Mining Inspectors

Gradually it has become plain that electric provisions are an essential part of any good mining code. Slowly there arises the conviction that statistics are the only safe basis on which such provisions can be prepared.

At this point we rest. So far it has not dawned on us that these statistics should be collected by an electrical engineer of ability, who would definitely determine just what caused the injuries, fatal or otherwise. Statistics are not intended to serve merely as stock-in-trade for the demagogue, but are compiled to furnish a sure and safe basis by which operating concerns, operatives and the community can remove the ills from which the workmen suffer. Consequently, detailed consideration of the teaching of each accident should be a part of every state mining report.

Some of the accidents need no clever exponent; they are clearly the result of carelessness and bravado. But some are not so simple and their causes should not be recorded briefly and inexpressively in the stereotyped form, "killed by electric shock." What progress would we

have made if our mine inspectors had all been tyros and described all explosion fatalities in the short, unenlightening form of "deaths from explosion."

But if we need an expert for statistics, still more do we need him for advice, to counsel the mine inspectors as to their duties and as to the exact meaning of the code, and to instruct them where to look for violations. When necessary, he should call the attention of operators to the needs of safety in electrical installation in cases where the law is inadequate to protect the operative. Such advice would almost always be well taken.

If it be well for the federal mining bureau to lock up its findings, we need someone who will not follow its lead, but will give the mining profession facts and figures which will enable it to eschew dangerous practices and condemn unsafe apparatus. The mine inspectors will be the first to declare that it is not their business to qualify as electrical experts, and it is well known that the electrical code of Pennsylvania, regulating the use of electricity in bituminous mines, was prepared by the advice of electricians, rather than under the advisement of the inspectional force.

In England, an additional inspector, Robert Nelson, has been appointed to give his entire attention to the electrical apparatus in the mines. His reports are extremely interesting and valuable. Such inspectors as Mr. Nelson are needed in the various states of this country. When an accident happens, which is not of the most obvious character, he should be present to analyze the conditions under which it occurred. His additional duties should be to advise the chief and inspectors and to visit the mines.

Education of Practical Men

Some years ago, in order to understand better what are the real needs and requirements of the average practical man in the matter of technical training, a number of letters were addressed to a selected list of intelligent mining men holding numerous positions of trust and responsibility while possessing but a limited knowledge of the simplest technical principles.

A few of the answers received in response to the inquiry, "What valuation do you place on technical training for practical men?" have since furnished me much food for thought. One letter

states, "No mathematical rule or formula is of any practical value to a mining man, unless he is able to apply it and produce results." Another, who evidently placed a low estimate on technical training, writes, "In the mine you can see the real thing." Others find fault with the textbooks they have studied and failed to understand.

It is true the ordinary textbook is not adapted to the needs of the practical man. As a rule, it lacks simplicity; teaches theory and principles but fails to explain the varying conditions that in many instances bar the application of these in practice; it includes much in its pages that is wholly unpractical. Little wonder then that men who *must produce results* see nothing that will help them in such books.

A book to be of practical interest must deal with a practical question in a simple practical way. The busy mine superintendent or mine foreman is constantly dealing with facts, and what he needs are simple facts and data that will enable him to produce the car of coal in less time or with less outlay than would be possible without the knowledge of such facts and data.

No stronger argument is needed today to prove the value of technical training than to contrast, for a moment, the man who has nothing to learn but relies entirely on his past experience, with another who continually studies to improve. The one is a victim of prejudices that constantly hinder his progress and keep him busy rectifying his mistakes. He realizes his errors but is too proud to admit them to others. The other is daily increasing his fund of information and his usefulness.

We call to mind a mine superintendent who, to increase the circulation of air in his mine, erected an exhaust fan at the upcast to assist the blowing fan at the top of the downcast shaft. When it became evident to his practical mind that the fan last erected would not draw, in connection with the fan already forcing the air through the mine, he found he "wanted to use the fan elsewhere" and ordered it removed. Such is the costly experience of many a practical mine official who would scorn to admit his need of further knowledge than that afforded by his own practical experience. We are glad to say their number is rapidly diminishing.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Geology in Coal Mining

Absence from home has prevented an earlier reply to C. P. Collins' discussion in your issue of December 9. In the meantime H. M. Chance, an esteemed former coworker on the 2d Geological Survey of Pennsylvania has added, in COAL AGE of December 23, some interesting and valuable remarks as to the peculiar province of the geologist and the mining engineer. Mr. Collins is entirely mistaken in supposing that my reference was to him in connection with the Ott case. The reference was to another eminent mining engineer upon whose advice and judgment concerning the disputed coal bed Mr. Ott appeared to rely implicitly when the writer visited the region in controversy. It was certainly unwise in Mr. Ott not to follow the advice of Mr. Collins rather than that of one who, however eminent, could not on account of the physical infirmities of age grapple with the stratigraphic problem so successfully as could the younger Mr. Collins. The experience of the writer in such cases is, that it requires much hill climbing ability to enable either a geologist or engineer to keep hold of the several elements in any of our coal series when not aided by a continuous line of mine openings or striking peculiarities in the individual coal beds themselves constant over a wide area.

I can most heartily endorse most of what Mr. Chance has said in drawing a distinction between the province of the geologist and that of the mining engineer, and yet the latter cannot afford to neglect the training given by practical geology, and if he could even add a fair knowledge of paleontology to his stock in trade, he would be still better equipped as a mining engineer. Mr. Chance was trained under one of America's most famous geologists, the lamented Lesley, who, unfortunately, until quite late in life, did not have much respect for the invaluable aid that fossil remains can give to either the mining engineer or geologist in solving difficult questions in stratigraphy. The brilliant and talented Ashburner, trained in the same school, would never have referred the Tipton Run coals to the Pocono beds, nor would Lesley have defended that position, had either possessed even an elementary knowledge of the vast difference in the facies of the Pennsylvanian and Mississippian floras.

Lack of time and opportunity prevented me from collecting and studying the flora of the Kanawha series. It was this mistake which led me to follow W. B. Rodgers and J. J. Stevenson when, on my first investigation, I correlated that series with the Allegheny instead of with the Mercer, where the paleobotanist, David White, first demonstrated that it belonged. There is hardly a doubt that had the services of David White been secured in the Ott case, he could have differentiated clearly the "B." and "C." coal beds on the farm in question, simply by means of the different fossil plants in the roof shales of the two seams, separated as they are by 90 feet of measures, and probably many thousands of years in time. Hence, while agreeing generally with most of that which Mr. Chance has said concerning the province of the geologist and the mining engineer, yet I can see no reason for holding that the latter should neglect training in both geology and paleontology even if my friend Halberstadt and Mr. Collins did reach correct conclusions in the Ott case without the aid of the latter.

I. C. WHITE,
State Geologist.

Morgantown, W. Va.

The Fireboss Question

In the issue of COAL AGE, Dec. 2, 1911, page 255, a Pennsylvania fireboss suggests putting a blackboard at the entrance to each working place so that the fireboss can put his mark on the board and miners can hang their checks thereon.

Why not have a rule that each man must come to the fireboss at a certain place designated by him, say the bottom or top of the shaft if it is a shaft mine, or at the mouth of the drift or slope. Gates should be provided at the mine entrance and should be kept locked while the fireboss is making his examination of the mine, and only opened when he returns.

Let each man, as he is about to enter the mine, call for the number of his room, stating the entry on which the room is located, and receive from the fireboss a report of the condition of such room, entry, or working place. The fireboss when making his rounds, however, should mark with a cross any dangerous piece of slate, roof, or coal regardless of giving to each man a verbal report of the condition of his place.

I firebossed in western Pennsylvania at a mine where this rule was in force and it

was a decided success. If firedamp was discovered I placed a danger board far enough ahead of the gas, and in a conspicuous place where no one could pass over it without seeing it. Any neglect to examine a working place before allowing men to enter should cause the fireboss to forfeit his position and certificate.

Marion, Ill. A MINE MANAGER.

Another Method of Testing for Blackdamp

In looking over Dr. Crane's method of testing for black damp, published in COAL AGE, Dec. 9, I was led back to a time years ago when I was studying "Inorganic Chemistry" and the "Chemistry of Mines" and "the Science of Mining." I think all books existing at that time, in the early '80s, gave CH₄ as firedamp and CO₂ as black damp and CO as white damp, or stone damp. And as a student, I could not reconcile "Roscoe's Chemistry" with "the gases met with in mines" as given in all mining books. Long ago, I determined that firedamp was CH₄ and air in varying proportions and that black damp was nothing more or less than air minus the oxygen taken up by burning lamps, or the lungs of animals or by the strata.

Soon I began to discover that the so called CO₂, given off by the strata, was not CO₂, but simply nitrogen. After making a number of experiments with lights and after testing for CO₂ by exposing jars of lime water I found headings at the face of which the lime water would not become milky yet the lights would burn exceedingly dim. Again I concluded this was evidence of nitrogen.

Finally, I discovered a certain test for examining a working place or airway to ascertain the amount of black damp present. This is not a test to determine a definite quantitative value but one which distinguishes between the amount of black damp that would render the place unhealthy beyond question and the amount a person might work in for a week or so without any great harm. I have shown this test to a number of people, several mine inspectors among others, and I thought it would be interesting to the readers of COAL AGE.

THE APPARATUS AND ITS METHOD OF WORKING

Now, don't laugh; the testing instrument is nothing but a small Dietz lantern! For eight years I have carried this in-

strument for lighting purposes and for making tests and by its use I can tell not only the state of the air in stagnant places but also where the velocities of the air currents run up to more than 1000 ft. per min. By means of this lantern I can show with unerring accuracy a cap much bluer and much more intense than that shown by firedamp on a Davy, Marsaut or Wolf lamp, and can show it in the Plymouth mines to anyone interested at any time. The *modus operandi* is as follows: Have a flame on the lantern about one inch high as you enter the suspected place and if black damp is present in unhealthy quantities the flame will be troubled and will reduce in size from 25 to 40 per cent. Now turn up the flame by a quarter of a turn or so and in the presence of black damp if you keep still you will get a beautiful blue cap with a small quantity of white or yellow flame at the two corners.

TO REGULATE THE AMOUNT OF FLAME

By placing the lantern on a solid box or desk you can regulate the amount of flame and see the little corners grow larger and smaller in accordance with the quantity of oxygen or, placing the lantern under a miners' cut, you can turn the light down, say, until it shows a flame of $\frac{3}{8}$ in. and then, without touching the wick, take the lantern out and the light will increase from 50 to 200 per cent. I have seen a flame of $\frac{1}{2}$ in. when taken from under a cut increase and fill the lantern with smoke in 10 seconds. Some day, perhaps, the inspection officials will test by this method and will not allow men to work in vitiated air without brattice cloth to drive it out. Especially in the Pittsburg seam, thousands of men work today in the mines in bad air not 80 ft. from the air course where probably 20,000 ft. per min. of good air is passing. While firedamp has killed its thousands, black damp has killed its tens of thousands.

Plymouth, W. Va. JOSEPH VIRGIN.

Labor Unrest in British Mines

There are specific indications that before long there will be a general strike of the miners working in the collieries of the British islands. The miners of all sections of England, Scotland and Wales have arrived at the conclusion, individually and through their organizations, that the time has arrived for an increase of wages, and that this increase must be of a substantial character. Like workmen all over the world, they are complaining that while the cost of living is increasing, their wages do not increase proportionately, and that in most cases they have remained stationary for years. The British miner is probably paid better relatively to the character

of his work, than any other form of labor in the country. He has on his side the advantage of being employed all the year round; his hours are shorter, and apart from the incidental risks of his occupation, the conditions under which he is employed might almost be said to be ideal.

As far as the increase of wages is concerned, an adjustment between the miners and operators might be arranged through the intervention of the officials of the board of trade, or through the machinery of a conciliation board; however, it must be admitted that the more experience the miners of Great Britain have with arbitration boards, the less inclined they are to submit their grievances to such a tribunal; in some recent local instances, they have positively declined to do so.

A MINIMUM DAILY WAGE

The fact is, however, the British miners are making another and more imperative demand, and one upon which everything will turn. The miners are about to demand a minimum daily wage scale. The officials of the British miners' union declare that there are thousands of experienced miners who are earning five shillings (\$1.20) or less a day. Of course, the average British miner in good times earns considerably more than this. Five shillings a day may be taken as representing the minimum wage-earning capacity of an indifferent miner in good times, and that of the average skilful miner in the worst of times.

Wages in British mines vary considerably with the district. The British miner is not migratory. Boy and man, he has probably worked in some colliery in which his father or even his grandfather worked, and he has small notion of "bettering his condition" by traveling farther afield in search of more remunerative or more satisfying conditions. He would not be welcomed among his associates out of his territory if he ventured, and realizing it, he seldom changes his abode.

The officials of the Welsh miners' union are now declaring that, unless the operators agree to a minimum wage of seven shillings a day, they will strike. The Scottish miners are still more exacting, for they say that they will not be content with less than eight shillings a day as a minimum wage. The miners of the Northern and Midland coalfields, while equally insistent on a minimum wage, have not yet formulated the sum with which they will be content. The coal operators are naturally much alarmed over the situation. They know from long experience that when the British miner says that he will strike, if certain demands are not conceded, he will strike. They know that he will remain on strike for months, until he wins, and that he does win eventually,

for when matters have gone so far, the government steps in and compels the operators to yield in the interests of humanity and national progress, while assuming an attitude of benevolent neutrality.

MINERS ARE SERIOUS IN THEIR DEMANDS

There can be no mistake about the attitude of the British miners just now. They say that they will strike and strike in a body if the minimum day's wage is not established. Can it be established? That is a question of incalculable economic importance at the present moment, for what the British miners are contending for today, our own men may be demanding tomorrow. Are the British miners about to insist through a general strike, upon a wage scale that cannot be complied with under the penalty of industrial bankruptcy? It is no use arguing upon or around the point. As well try to divine the result of an impending battle where both armies are equally matched. We must await the result to judge scientifically of the strength and the inevitableness of the causes that brought the matter to an issue.

Nor is it of the slightest practical advantage to go on resolving economic conundrums, by pointing out with Adam Smith or his sophisticated followers, that an increase in wages increases the cost of the necessities of life in a proportionate ratio, that the miner with his increase will be no better off than he was before, and that the rest of the community will be much worse off through his folly in pursuing a chimera. A bird in the hand is worth two in the bush, so the miner thinks. Money is power, or it is nothing. With more money in his hands, he realizes and experiences the fact that he can secure greater and more varied comforts and that is enough for him. This is the substance of a speech, a long speech by a labor member of Parliament, that was delivered a short time ago at a mass meeting of Welsh miners near Cardiff.

New Castle, England. "AMERICAN".

Piece Work in Mines

Regarding the argument for piece work in mines, one case in a British mine may interest COAL AGE readers. At the Clydach collieries when the two-foot nine-inch seam price list was fixed, it was laid down that all men working in abnormal places should receive \$1.28 per day, plus the usual percentages. The arrangement, however, had very soon to be abandoned. The miners tried to enforce the continuance of the original agreement, and took a case to the County court. It was then proved that the two miners selected as plaintiffs in the case had not performed a fair day's work. Two other men, put in the same rooms, got 63 per cent. more coal and did 10 per cent. more dead work.

Wigan, England.

D. A. T.

Review of 1911 Coal Industry in Western Pennsylvania

The year just passed has been rather an eventful one in the history of the anthracite coal trade. Estimated figures submitted, place the output of the anthracite coal fields at more than 74 million tons, an excess over the previous record year of some five to six million tons. This increase has been made possible by an almost unprecedented demand for this grade of fuel all over the country. This has been particularly true of the closing months of the year, and is attributed by some to the fear of trouble in April, but it appears to be a natural increase. The year 1912, or rather, the early part of it, will record the impressions of the public on laying in supplies of coal, in anticipation of a return of the trouble that was theirs during the year 1902.

Philadelphia of itself, will more than likely show a comfortable increase over its estimated consumption of about 4,600,000 tons annually. The year has been marked by a succession of encouraging business conditions, only to be followed by depressions. It opened with a good demand, which continued until early in March, when the business fell off considerably, in anticipation of the April reduction in prices. A brisk trade followed during the months of April and May, with a gradual cessation during June, and almost a complete falling off in July and August. September was a slight improvement, but many of the dealers were not optimistic as to the future. It was not until early in October that the rush started, and it has required the best efforts on the part of both the wholesalers and retailers to meet the situation. This condition continued throughout the balance of the year.

The year 1911 also witnessed an advance of some of the sizes of anthracite coal. The April circular brought the first change, which took place in the price of chestnut. This was increased 25c. over the price of stove, and took the usual monthly advances of 10c. per ton. The reason advanced by the operators for this increase was, that the demand for chestnut coal was far in excess of the production, and in order to teach the public to use stove, the lash of higher price was applied. It did result in increasing the demand for stove, but there was no apparent falling off in the demand for chestnut, as all the companies, it is understood, have been behind on deliveries of both sizes.

Taking effect on Jan. 1, 1912, the contract price of rice coal will also be advanced from 65 to 85c. per ton, and the tidewater price of broken will also take on 25c. to the hitherto market price of \$4 f.o.b. vessel. The demand for the latter size of anthracite has been unusual during the last couple of years. Heretofore, the companies always had stocks

of this grade, but it is understood that most all of this coal has been picked up, and the output is inadequate to meet the current demand.

The bituminous trade has been unsatisfactory the year throughout. Buds of optimism were frequently covered by clouds of gloom, and many dollars were expended for demurrage on coal sent to the market, on the strength of anticipated improvement, that only too frequently fell flat. The year had hardly been started when the first symptoms of weakening occurred, and this unsatisfactory condition continued, with only occasional spells of fair business, although during the latter part there were some signs of strength. It is now evident, however, from present indications, that the season will not be a "red letter," in the history of the bituminous trade.

A Buffalo View of Coal Business During 1911

The year 1911 has been a poor one for the coal trade with regard to new business. As one of the leading operators says, the mining interests made ready for a liberal development, but as the year proceeded there was so little added business that most of them waited to see what another year would bring about. Now they say that the prospects are not any more promising.

The most notable increase of capacity in the Buffalo territory has been made by the Shawmut Coal & Coke Co. After acquiring the large Knoxdale district a year or two ago the company again began new operations in what are called the Seminole and Chickasaw districts further south in Armstrong County, Penn. They had considerable coal at the surface several months ago, but the railroad was not finished as shipping has been delayed. The road is now through and coal has been loaded, ready for marketing. The increase will give the company an added capacity of 3500 to 4000 tons daily and an aggregate capacity from all its mines of about 2,500,000 tons annually.

The coal from the new Shawmut mines differs somewhat in physical appearance, that from the Seminole section being of the Freeport variety, with a somewhat ragged fracture, while the Chickasaw coal is Kittanning, with a decided square fracture; both coals are of about equally high grade. All the Shawmut coal will be sold, as formerly, through the office of Vice-president Jones, at Buffalo. It is probably the largest single coal interest that finds sale in Buffalo.

Most of the large bituminous coal interests tributary to Buffalo have contented themselves with keeping up, or somewhat increasing their annual output without much effort to add to their actual mine territory. The Rochester & Pitts-

burgh Coal & Iron Co. has bought considerable new land, especially in Indiana County, and is mining more coal than ever before, with apparent intensions of opening more mines as soon as there is a good paying demand for them.

Of the individual operations those of Frank Williams & Co., of Buffalo, have improved considerably during the year. The company's Hillville mine especially is turning out about 300 tons more a day than it did a year ago, in response to a liberal amount of money spent on its general capacity.

There has been a notable showing made in late years by the Fairmount Coal Co. in the Allegheny Valley, the former Pennsylvania R.R. property, now operated by the firm of E. L. Hedstrom, of Buffalo. The main increase is in the output of cannel coal from the Bostonia, or No. 8 mine, and will give the mine an output this year of about 500 tons a day in place of 300 tons a year ago. A still further increase is probable, for the coal sells at a much greater profit than ordinary bituminous.

As to apparatus the tendency in all the mines is toward a complete electric-haulage system and many of the Allegheny Valley mines are now equipped with it. There is much experimenting with coal cutting devices that generally propose to do away with the use of powder.

Southern Ohio in 1911

Looking back over the year now closing it may be said that while a few coal concerns claim to have done an entirely satisfactory business, the majority admit that the year has not been up to what was hoped at the beginning of 1911. Even the beginning was not full of promise, considering the immediate demand at that time, the market having suddenly broken from the unusually good one during the three or four months at the end of 1910. It was thought some mysterious conditions, not then understood, were at work and there would be an early and continued revival both of demand and prices. But as the year advanced it was seen that the disorder was more fundamental. It seems now that the trouble has been one of general business conditions and that the coal trade has not been the only one to feel the effects.

With the opening of the lake trade there was an increased demand for lump coal and this continued until well into the fall. But during all this time the general demand for steam fuel was light. This continued until October, when the demand both for steam and domestic coal again picked up and for two months a distinct revival was noted, due to the approach of winter. The past few months have been a disappointment. Unusually warm weather has prevailed most of the time with the result that the demand is what it is today.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

HOW AIR IS PUT IN MOTION

Ques.—Explain how air is put in motion in mining: (a) By natural means; (b) by means of a furnace; (c) by means of a fan.

Ans.—Air is a fluid and always moves from a point of higher pressure to a point of lower pressure. If the pressure at one end of a pipe is greater than that at the other end, the air in the pipe will move toward the end where the pressure is less. The same way, in mine airways, the air current moves in the direction of the lesser pressure. The difference between the two pressures is the force that moves the air.

NATURAL VENTILATION

(a) In a mine, a natural difference of pressure is created in at least three ways: 1. By directing a strong surface wind into one of the openings of the mine. 2. By causing a waterfall in one of the mine shafts. 3. By the natural heat of the mine making the air in one shaft warmer and therefore lighter than that in the other shaft. The first two methods mentioned are rarely used, at the present time, in coal mining; but the last method of producing natural ventilation is common in mines.

FURNACE VENTILATION

(b) The same principle applies in furnace ventilation, as explained in natural ventilation. The air in one shaft (furnace shaft) is heated and made lighter than that in the other shaft, or than the outside air. In this case, however, the heat is the artificial heat of the mine furnace, which is located near the foot of the furnace shaft. In furnace ventilation, as in usual natural ventilation, there are two columns of air of different temperatures. The warmer air is lighter and rises, while the cooler air, being heavier, falls. The furnace shaft is, therefore, always the upcast shaft.

FAN VENTILATION

(c) Mine fans are of two types, which act on different principles. The disk fan has ordinary propeller blades or vanes, and these act to propel the air. The action is exactly the reverse of the common windmill, where the wind propels the wheel by striking against the inclined blades.

The more common type of mine fan

is the centrifugal fan. In this, the centrifugal force developed by the revolution of the air contained in the fan, forces the air out from the center to the circumference, where it is discharged. Air is continually drawn in at the center and thrown out at the circumference. The fan acts to create a difference of pressure between the intake and discharge openings, which difference of pressure is the mine ventilating pressure.

EXHAUST FANS AND BLOWERS

The principle of action is the same in exhaust fans as in blowers; the only difference between these two types being that when the fan is exhausting the mine airways are connected with the center orifice of the fan, but when blowing they are connected with the discharge orifice. In each case, the air flows through the fan from center to circumference.

In the exhaust system of ventilation, the mine pressure is below that of the atmosphere, the depression being created by the action of the fan; and the atmospheric pressure then forces the air through the mine airways.

In the blowing system, the mine pressure created by the fan is above that of the atmosphere, and the air is forced by this pressure through the mine airways and discharged into the atmosphere.

MINE VENTILATION

Ques.—(a) What are the factors that make up the resistance that retards the motion of air in mines? (b) Is the ventilation of a mine improved simply by increasing the velocity of the air current?

Ans.—The resistance offered by an airway to the flow of the air current is due to the friction of the air rubbing on the sides, top and bottom of the airway. (a) The factors that determine this resistance are the coefficient of friction, the amount of rubbing surface and the square of the velocity of the air, as given by the formula for mine resistance:

$$R = k s v^2$$

(b) To obtain the best results in mine ventilation, the velocity of the air should be sufficient to sweep away the gases that would otherwise accumulate in the working places. A high velocity of the air sweeping the working face is not desired, because of the inconvenience and discomfort it causes the men. On the other hand, too low a velocity stagnates the air, which is unhealthy.

The ventilation will be improved by increasing the velocity, only when this can be done without discomfort. In thin seams, where the sectional area of the airways and passages is small, and the quantity of air in circulation insufficient for proper ventilation, the air current should be split one or more times, instead of increasing its velocity. On the other hand, in thick seams, with large areas of passage, the ventilation can often be improved by increasing the velocity of the current.

Pennsylvania Questions

PRINCIPLE OF A SAFETY LAMP

Ques.—What is the principle of a safety lamp?

Ans.—The principle of the unbonneted safety lamp is: (1) The isolation of the flame of the lamp and the gas that may fire within the lamp, from the outside atmosphere, by means of a gauze chimney, as in the Davy lamp, or a combined glass-and-gauze chimney, as in the Clanny; (2) The extinction of the flame of the burning gas as it attempts to pass through the meshes of the gauze, due to the cooling effect of the wire.

In a bonneted lamp, the bonnet so retards the circulation and confines the burnt air in the top of the lamp that no flame can pass out or even reach the upper portions of the chimney. This principle is of great importance, as it protects what would otherwise be the weakest point in the lamp—the top of the chimney.

EXAMINING A MINE FOR COAL DUST

Ques.—When examining a mine, what observations should be made relative to coal dust?

Ans.—This will depend on the importance of the coal-dust question, in respect to the safe condition of the mine. Where the coal is soft, friable and highly inflammable, it is of the utmost importance to examine closely the condition of all working places and passageways with respect to dust. Roads must be cleaned regularly at frequent intervals and all fine coal and dust must be loaded out with the coal, in dust-tight cars. In some cases, it may be necessary to brush the dust from the ribs and timbers, from time to time, in the working places. The manner in which these precautions receive attention should be carefully observed in the examination of the mine.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission, on Jan. 6, heard arguments regarding the investigation and suspension of the proposed advances in the rates by carriers for the transportation of bituminous coal and coal briquets from the Harrisburg district in Illinois to Chicago and Milwaukee and other points. The commission has suspended the proposed advance of 3c. in these rates until after the present investigation is concluded.

M. F. Gallagher, counsel for the Elmore Benjamin Coal Co., one of the interested parties in the case, opened his argument by saying that "some of the present differentials, in respect to the Chicago market in favor of other bituminous fields in Indiana and Illinois, as against the Harrisburg district, are as follows:

DIFFERENTIALS ON COAL TO CHICAGO

In favor of Linton District.....	15c.
In favor of Princeton District.....	8c.
In favor of Chandler District.....	5c.
In favor of Duquoin District.....	5c.
In favor of Springfield District.....	20c.
In favor of Terre Haute District.....	25c.
In favor of Danville District.....	28c.
In favor of Northern Illinois District.....	45c.

It was noted that on Dec. 10, 1910, the Big Four R.R. advanced the rate of 95c., then in effect from the Harrisburg district, to \$1.02. It is now proposed to make this rate \$1.05 to Chicago.

ARGUMENT OF THE COAL COMPANIES

The attorney asked: "Will this commission sanction an advance in an interstate rate which is forced by other carriers serving another coal field, for the purpose of supporting their own higher rate, which this commission has no power to investigate or regulate? These protesting shippers have a legal right to a just and reasonable rate for the haul of their product from Harrisburg to Chicago by the Big Four R.R. That right is guaranteed by the Act to Regulate Commerce. Will that right be taken from them upon a record offering but one pretense of justification, viz.: The operators in an adjoining coal field have been unwilling or unable to induce their carriers to lower their rate to the level of the Harrisburg rate?"

Speaking of the Milwaukee rate the attorney continued: "If the advance to Chicago is approved, it does not follow that the rate to Milwaukee, which was proportionately higher and governed by entirely different conditions, should be advanced. We earnestly and respectfully

submit, that no sufficient or lawful basis has been shown to sustain the advances in the through rate from the Harrisburg district to Milwaukee, and that the same should therefore be disallowed, and reparation should be ordered upon the basis of such a rate as this commission may deem fair and reasonable."

A statement was filed with the commission by seventeen coal companies operating in competition with the Harrisburg coal concerns, in which they stated that they represented approximately 90 per cent. of the total tonnage produced in Williamson and Franklin Counties, Ill. The statement requested an early decision of this case on the ground that upon the results of it these companies may desire to make representations to the Illinois State Railroad and Warehouse Board in the matter of their own rates.

THE RAILROADS' CONTENTION

The argument upon which the carriers rested their case was mainly as follows: "The rate of \$1.05 from the Harrisburg district to Chicago should not be condemned as unreasonable upon this record, since the effect of such a finding would be to disturb all other coal rates into Chicago and affect carriers who are not parties to this proceeding and have had no opportunity to offer testimony, or to be heard in argument."

COMPLAINT FROM NASHVILLE

The Traffic Bureau of Nashville, Tenn., today complained to the Interstate Commerce Commission of the rate on coal from the mines in western Kentucky to Nashville over the Louisville and Nashville R.R. It was stated that this rate is now \$1 per ton, whereas it should be but 50c, in order that Nashville shall not be discriminated against in favor of other points. The bureau also complained of the rates on coal from the mines in the states of Alabama and Tennessee over the Nashville, Chattanooga & St. Louis R.R.

WESTERN TARIFFS SUSPENDED

The Interstate Commerce Commission has suspended, until May 11, the proposed advances in the rates on soft coal from mines in Christopher, Ill., to points on the Missouri Pacific R.R. in Missouri, Kansas and Nebraska. These rates were filed by W. H. Hosmer, agent for the western trunk lines. Other tariffs of these roads proposing similar advances, which were

previously suspended until Jan. 13, have been further suspended until June 13, in order to give the commission time to pass upon the reasonableness of the rates.

Alabama

Birmingham—After a long conference, Dec. 30, a contract was finally agreed upon for the operation of the Banner mine of the Pratt Consolidated Coal Co. by the convict department of state of Alabama. The agreement provides that the state shall work the Banner mine and deliver the coal on cars, washed, at the surface of the mine, for 65c. per ton. The coal company has guaranteed that the state shall receive not less than the amount that was received from the employment of convicts under contract with the Tennessee Coal company and in substantiation of this guarantee has placed itself under a \$30,000 bond.

It is reported that the Tennessee Coal, Iron & R.R. Co. will at once begin the erection of 50 houses near mine No. 2 at Ensley and also a large number near mine No. 12. Both mines will henceforth employ free labor and the houses are required for the accommodation of the new workmen.

Colorado

Denver—A formal complaint has been filed with the state railroad commission to compel a reduction in the rate for hauling coal from the northern coal fields to Denver. This is the first step to be taken by the present coal investigation committee of the Denver chamber of commerce.

Announcement was recently made in Denver of the sale in New York of \$2,000,000 of bonds of the reorganized Rocky Mountain Fuel Co., which lately acquired the Northern Coal & Coke company from the late Charles B. Kountze. The company, not long ago, executed a mortgage for \$4,000,000 on all its property, to secure \$4,000,000 of twenty, to thirty-year 5 per cent. gold bonds of \$1000 each. For the present, \$3,500,000 of these securities will be issued.

Trinidad—It is understood that a branch of the national organization of the United Mine Workers of America has been established at Trinidad, in

charge of John R. Lawson, national board member for Colorado, who will arrange the work to be looked after in the Southern coal fields.

Illinois

Collinsville—The first underground emergency hospital in Illinois was opened Jan. 1, in one of the large coal mines in this vicinity.

Decatur—Charged with defrauding the Pana Coal Co.'s miners out of \$25,000 within the past five years the two check weighmen, for the company and the miners respectively, have pleaded guilty and asked leniency.

Gillespie—Mine No. 3 of the Superior Coal Co., one day recently, hoisted 4468½ tons of coal in 8 hours, giving this mine the record hoist for the state of Illinois. This coal was raised a distance of 412 ft. and discharged onto a single-track chute; 107 railroad cars were loaded and 1392 mine cars dumped. The state record was previously held by the Livingston mine at Staunton with a total of 4265 tons in 8 hours to its credit.

Belleville—It is probable that the 30,000 acres of coal lands which have been under option for the past few years by David O. Thomas and the late E. L. Thomas, will be opened up in the course of the next year under the direction of George J. Kobusch, of St. Louis. It is understood that contracts have been drawn up for the construction of a railway that will be about 30 miles in length, and plans have been made for the top works of two mines which in the course of two years' time will each have an output of 3000 tons per day.

Indiana

Linton—Fire, in the morning of Dec. 27, destroyed the tippie and engine house of Vandalia Mine No. 21. The loss was \$15,000, covered by insurance. Three hundred men were thrown out of employment.

Fire recently destroyed the tippie and adjoining buildings of the Horney & Winterbottom Co.'s mine near Washington in the Davis County field. The fire was caused by the explosion of gasoline that had leaked from a hoisting-engine supply; loss, about \$20,000.

Petersburg—One of the largest coal deals ever made in this state was closed Dec. 30 when 10,000 acres of coal land near Carlisle were sold. Two hundred and fifty-one farmers were notified that the options on the coal underlying their land would be taken up at once by a group of New York and Chicago capitalists. The holdings of the Fairbanks Coal Co. and other tracts previously sold are included in the deal and make a

total of over 16,000 acres. Extensive tests have shown the existence of a good seam of coal lying from 70 to 160 ft. beneath the surface. It is understood that the purchasers will have several modern mines in operation by Jan. 1, 1914.

Kansas

Pittsburg—An explosion in mine No. 7 of the Girard Coal Co., at Radley, on Jan. 4, was thought to have killed two shot firers. The men had telephoned to the surface a short time before the blast, however, and their location being known, a rescue was effected.

Kentucky

Barbourville—A recent important coal deal in this section was the purchase of a large boundary of land on the Cumberland River near Artemus, Knox County. The land is skirted on the southeast by the Cumberland railroad, and is only a short distance from the main line of the Cumberland Valley division of the Louisville & Nashville R.R. It contains the well known Dean seam in the tops of the mountains and also the smaller veins found on Brush Creek.

The Brush Creek Coal & Manufacturing Co. has everything in readiness for shipping coal at an early date. The company will produce 200 tons per day at first, and will increase the daily output by 100 tons a month. The mine is at Jones' trestle, near the end of the Cumberland railroad. It is rumored that the line will be completed clear through to Jellico the coming year, as the grading was completed over the entire route some time ago.

Madisonville—Articles for a new corporation to operate in Hopkins County are being drawn up under the name of the Clear Creek Coal Co. The firm is composed of Delaware men, and it is stated that it will buy one of the largest coal fields in this county.

Harlan—The Clover Fork Coal Co., of Harlan, has filed articles of incorporation, with a capital stock of \$50,000. The incorporators were former owners of the Left Fork Coal Co., on Straight Creek, which is now owned and operated by the Continental Coal Corporation. They recently purchased a large body of fine coal land near here and are preparing to begin development.

Michigan

Owosso—The Robert Gage Coal Mining Co. is making tests for coal on four adjoining farms in Rush township. Options secured several months ago expire in the spring and it is understood that a shaft may be sunk.

Minnesota

Duluth—A traffic deal has just been made between the Shenango Furnace Co. interests and the Carnegie Coal Co., of Pittsburg whereby the lake vessels of the furnace company will be assured a return cargo of coal from Lake Erie ports. The Shenango Furnace Co. is capable of shipping 2,000,000 tons of ore a year down the lakes, and the Carnegie people are rapidly approaching that tonnage in up-bound coal.

Montana

Red Lodge—The Supreme Court of Montana, by unanimous opinion, has held as unconstitutional and void the law popularly known as the "Coal Miners' Accident and Total Disability Insurance Law."

Ohio

Steubenville—Fire, starting from a crossed electric wire in the weigher's room of the Hitchman Coal Co.'s tippie at Benwood, Dec. 29, totally destroyed the tippie, which had been recently repaired, throwing out of employment several hundred men and causing the mine to suspend operations until the damage can be repaired.

Bridgeport—It is reliably reported here that the proposed \$25,000,000 merger of eastern Ohio coal properties will be consummated in February. This was stated by a prominent coal operator following a conference with the New York banking house which is to finance the proposition. It was said that only the larger companies, those operating mines employing 500 men or more, would be included in the consolidation.

Wellston—A coal deal in which 26,000 acres of land and about \$2,000,000 are involved has just been closed by John Winefordner, of Zanesville, and his associates, E. C. Hargrave, of Bay City, and J. Morrow, of Wellston. The coal property lies in Hocking and Vinton Counties. E. B. Bingham, of New York, represented the buying company.

Pennsylvania

BITUMINOUS

Clearfield—A decision has been rendered in the case of the Puritan Coal Mining Co., against the Pennsylvania R.R. Co., awarding the coal company damages amounting to \$74,323. Suit was brought several years ago to recover damages which the Puritan company is said to have sustained at its mines in Cambria County, through discrimination practiced in the distribution of cars for the shipment of coal.

Connellsville—Announcement has been made by the H. C. Frick Coke Co. of its

intention to fire 1499 additional ovens. For the present all plants in the region will be run six days per week.

In an official statement issued by the W. J. Rainey Coke Co., announcement was made that within two weeks the entire 3000 ovens of the company in this region will be in full blast. Of this number, 2200 are now burning, and officials of the company say that the outlook is encouraging. There is activity among the independent operators throughout the entire coke region.

Great excitement prevails in the Indian Creek Valley over the apparently well authenticated report that the options held on 25,000 acres of the underlying coal, the Freeport veins, will at once be taken up by a Baltimore company and a round million paid to the owners. It is known that the option on 4000 acres has already been accepted. A corps of engineers has been busy for some weeks locating the property lines and making surveys, and as soon as the lines and amount of coal can be definitely determined, the options will be accepted, deeds made and the property turned over at an average price of \$40 per acre. It is reported that the Western Maryland is the real purchaser, but the company officials here declare that the company has nothing whatever to do with it. It is understood that the Western Maryland contemplates the purchase of the Indian Creek Valley R.R., thus gaining control of the entire coal field.

Brownsville—The Alicia plant of the W. H. Brown Co., at Rush Run, idle for the past two months, has resumed operation. All 200 ovens will be fired within the next 10 days.

The Isabella works of the Isabella-Connellsville Coke Co., will resume operation early this month. The entire plant of 400 ovens will be fired.

Johnstown—The Dunwiddie Coal Co., at Bakerton, has suspended operations because of the strike of 175 miners, following a conference between the miners and the company, regarding "dirty" coal, which the men were charged with sending out. No effort has been made to resume with imported workmen.

ANTHRACITE

Scranton—The final arguments were heard recently in one of the biggest coal suits ever tried in Lackawanna County. It is the case of the New York Trust Co. against the Langcliffe Coal Co. and others. The Hudson Coal Co., a subsidiary of the Delaware & Hudson Co., is the actual defendant, and the amount involved is over \$600,000. The New York Trust Co. seeks to foreclose on a mortgage for \$325,000 with accrued interest that brings the total to over \$600,000, which was given years ago to the Wilkes-Barre & Hudson River Improvement Co., by the Langcliffe Coal Co.

Two men were killed, one was seriously injured and several had narrow escapes recently in a slide of rock at the surface workings of the Scranton Coal Co., near the entrance of Nay Aug Park. The victims of the accident were digging a hole preparatory to blasting, when, without warning, the huge bank caved in upon them.

Wilkes-Barre—Governor Tener has announced the appointment of a commission to revise and codify the present anthracite mining laws of Pennsylvania. The commission will hold its meetings in the city of Wilkes-Barre, where all persons who are interested in the revision and codifications of the anthracite-mining laws may appear and give expression to their views. The commissioners are authorized to call into consultation any person who, in their opinion, may be able to give information that will assist in the work of revision. A report will be made to the legislature in 1913.

Pottsville—The mammoth breaker and coal tracts of the St. Clair Coal Co., owned by Scranton capitalists, were sold Dec. 30 to a syndicate composed of Brown Brothers & Co., bankers, of Philadelphia, and Kreft & Co., coal operators, of New York City.

Tennessee

Knoxville—Arthur Scott, one of the five men rescued from the Cross Mountain coal mine at Briceville, has a new theory of the explosion. He said: "A gang of men went into right entry No. 25 Saturday morning. They began work at the 'head.' It had not been worked for five weeks. A 'gas lead' had been noticed in the heading of that entry for a long time, and I believe that enough gas had accumulated in that heading to set off a coal-dust explosion when an open light was applied to it and the men who began work there on the morning of the explosion carried open lights."

Washington

Castle Rock—It is reported that H. B. Davies and associates of Tacoma have leased the old Huntington coal mine and are preparing to open it soon. It is also reported that the Red Ash mine in the same district will be opened again, after a long idleness, the property having been leased by E. C. Easton and associates, of Portland. Machinery for pumping out the mine has already been installed.

Some time ago men in the employ of E. N. Ouimette, of New York, were at Castle Rock looking for coal that could be manufactured into briquets. Samples were obtained from several mines and taken to New York. A few days ago it was reported that the samples from the old Idleman mine had proved satisfactory

and that it is the intention of Mr. Ouimette and associates to install a \$300,000 plant for the manufacture of briquets.

West Virginia

Thomas—Fire of unknown origin; Jan. 5 destroyed the blacksmith, carpenter and machine shops and the winding room of the Davis Coal and Coke Co. at its drift mine. The loss is estimated at \$12,000.

Morgantown—A deed has been placed on record conveying the Pittsburg coal underlying seven tracts of land in Clay district and aggregating 532 acres to J. V. Thompson, a Uniontown, Penn., capitalist.

The Miller Coal & Coke Co. has sold to Henry & Gibson, of Pittsburgh, 640 acres of coal and their mining plant at Gage, W. Va., including their store and all equipment. This is an up-to-date plant with electrical haulage, coke ovens, electric coke larry, and has been in operation about five years.

Canada

Vancouver—The Canadian Pacific Railway has finally decided to build the Esquimalt & Nanaimo Ry. to Hardy Bay, the extreme north point on Vancouver Island.

The Western Fuel Co., of Nanaimo has sunk two new shafts at an outlay of nearly \$2,000,000, to be completed this year and ready for operation in 1913, when it is anticipated 1200 more miners will be employed and the output of coal doubled.

Belgium

Brussels—A general strike of miners is threatened. Miners to the number of 25,000 in the Borinage district have gone on strike and the movement is spreading. A general stoppage of work is probable.

England

London—Reports from the coal mining districts, Jan. 6, indicate that the United Kingdom will be tied up by one of the greatest strikes in history March 1. Balloting will begin Jan. 10 on the question of whether a minimum wage scale will be demanded in addition to a number of other minor concessions. Reports from the mining districts indicate that the men will be practically unanimous in declaring for the minimum wage. This undoubtedly will mean a strike, as the operators have refused to consider this demand. In the event that the concession is not granted more than 1,000,000 men will quit work.

Personal

E. C. Smith, Des Moines, Iowa, has been re-elected president of the Iowa Coal Operator's Association.

H. M. Waite, vice-president and general manager of the Clinchfield Coal Corporation, has resigned, effective Jan. 1, to become city engineer, Cincinnati, Ohio.

Walter S. McCloud, Wellston, Ohio, has been made general manager of the Superior Coal Co., of Columbus, succeeding H. E. Loomis, resigned. Mr. Loomis retains the office of vice-president.

J. U. Gridley has resigned as general manager of the Wyoming properties of the Sheridan Coal Co., at Dietz, Wyo., effective Jan. 1, 1912. Mr. Gridley's connection with the Sheridan company has extended over a period of 17 years, and it is with much regret that his resignation is announced. He will be succeeded by H. S. Hopka, formerly superintendent of the Bearcreek Coal Co., Bearcreek, Mont. Mr. Hopka has had a wide experience in coal mining.

Baird Snyder, Jr., general superintendent of the Lehigh Coal & Navigation Co., Lansford, Penn., has announced his resignation, to take effect at an early date. Mr. Snyder has been connected with the Navigation company for a number of years and his loss will be severely felt. It is rumored that F. M. Chase, general superintendent of the Lehigh Valley Coal Co., Wilkes-Barre, Penn., or E. T. Connor, mining engineer, of Philadelphia, Penn., may succeed Mr. Snyder.

The personnel of the committee recently appointed by Gov. Tener to revise the anthracite-mine laws of Pennsylvania, is as follows: Sterling R. Catlin, Wilkes-Barre, state senator, chairman; Edward E. Jones, Susquehanna County, member House of Representatives; James E. Roderick, Hazleton, state chief of mines; W. R. Rheinhardt, Shamokin, operator; W. G. Robertson, Scranton, operator; W. D. Owens, West Pittston, operator; Martin Nash, Glen Carbon, Schuylkill County, mine worker; H. C. Morgan, Scranton, mine worker; Peter O'Donnell, Wilkes-Barre, mine worker.

Obituary

William Redfern, superintendent of the No. 2 mine of the Pittsburgh Coal Co. at Scott Haven and one of the best known mining men of the Pittsburgh district, met a tragic death Dec. 27, when run down by an electric motor. Mr. Redfern had been in the employ of the Pittsburgh Coal Co. for a number of years and had spent practically his entire life in the Pittsburgh district. He was widely known by mining men and this acquaintance was extended through

membership in the Mining Institute of the Pittsburgh district.

W. W. Taylor, president of the St. Paul Coal Co., died at the home of his daughter, at Roundup, Mont., Dec. 29. Death came unexpectedly from blood poisoning. Mr. Taylor was general superintendent of the Cherry mine at the time of the great disaster, in November, 1909. He was a member of the Illinois State Rescue Commission, and had recently been made president of the St. Paul Coal Co., having virtually discharged all the duties of this office for some time previous. Mr. Taylor had mining interests in Illinois, Montana and Iowa, and was well known in these states; he had recently removed his offices from Chicago to Ottawa, Ill.

Construction News

Sullivan, Ind.—The Indiana Coal Conservation & Development Co. will soon ask for bids for sinking shafts and building tipples and power houses.

Petersburg, Ind.—New York and Chicago capitalists acting through Wm. Hayes, trustee, have acquired over 16,000 acres of coal land near Carlisle, including the properties of the Fairbanks Coal Co., and the Paragon, United Traction, and Bainbridge companies. It is reported that eight modern mines will be equipped for operation by Jan. 1, 1914.

Barboursville, Ky.—The Anchor Coal Co. will open a mine early this year on the property near Artemus, recently leased from A. Croley & Son. A new plant and mining camp will be built and machinery installed.

Clearfield, Penn.—It is understood that the Pennsylvania Coal & Coke Corporation intends to electrify all its mines in Clearfield, Blair and Indiana Counties, not at present equipped for electrical operation.

Portland, Me.—Frank M. Churchill, architect, has prepared plans for a \$30,000 addition to the coal pockets of the Cash Fuel Co. on Washington Avenue. The plant will be electrically operated.

Columbus, Ohio—The Hocking Power Co., whose ultimate object is to build a large plant to supply power for mines and municipalities, has been incorporated for \$50,000. It has taken over the Hocking Electric Power Co., of Nelsonville, and will rebuild the plant.

Baltimore, Md.—It is reported that the Philadelphia, Baltimore & Washington R.R. will construct coal trestles and bunkers at Baltimore. Gamble Latrobe is general agent.

Washington, D. C.—The contract for repairs to two conveyors at coal shed "A", U. S. Naval Station, Key West, Fla., has been awarded to the Brown Hoisting Machinery Co., of Cleveland, Ohio, at \$18,000.

New Publications

JOURNAL OF THE WESTERN SOCIETY OF ENGINEERS, November, 1911. 162 pp., 6x9 in.; illustrated in text and by 28 inserted plates. 50c. per number; \$3 per volume of 10 numbers.

Among other articles, this issue contains the following: Papers on "Foundation and Sewer Work with Costs and Comments," by Victor Windett; "Ball Bearings for Heavy Loads," by H. Gansslen, and "The Chicago River Tunnels, their History and Reconstruction," by William Artinshall.

PUBLICATIONS BY THE BUREAU OF MINES.

Free on request to the Director, Bureau of Mines, Washington, D. C. Not more than one copy of the same bulletin can be given to one person.

Bulletin No. 19. Physical and Chemical Properties of the Petroleum of the San Joaquin Valley, California. By I. C. Allen and W. A. Jacobs. Chapter on analysis of natural gas from southern California fields, by G. A. Burrell. 1911. 60 pp., 6x9 in., 2 plates.

Bulletin No. 26. Notes on Explosive Mine Gases and Dusts. By R. T. Chamberlin. Reprint of U. S. Geological Survey Bulletin No. 383. Copies will not be sent to persons who received Bulletin No. 383.

Trade Publications

Ingersoll-Rand Co., 11 Broadway, New York City. Pamphlet form No. 4016, "Imperial" Telescope-Feed Hammer Drill, Type "MC-22." 12 pp., 6x9 in., illustrated.

This drill is a "valveless" type, in which the piston itself performs the valve functions by covering or uncovering ports, which control its forward-and-back movement. This tool is intended for stoping, raising, and, to a limited extent, drifting. It is not recommended for steady work in holes at less than 20 deg. from the horizontal, because of the difficulty of cleaning such holes. The telescope feed of the "MC-22" is that designated by the company as the "reversed feed," in which the inner or piston tube is attached to the drill, and the outer or cylinder tube runs out under pressure. The advantage of this arrangement is that the hose is stationary, not turning with the drill; and the tool may be used on a tripod or column by clamping the outer-feed cylinder to the mounting.

Du Bois Iron Works, Du Bois, Penn. Catalog No. 32. Steam and Power-Driven Pumps. 32 pp., 6x9 in., illustrated.

This company manufactures a line of pumps for boiler feed, mining and numerous other forms of special service. Steam, electric, gasoline-engine and air-driven types are briefly described. Tables of capacities, dimensions, etc., of standard-size pumps are given.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The general tone of the coal market continues strong in all sections, with prices firm or advancing. An abrupt fall in temperature, accompanied by severe storms at some points, has developed a heavy demand for domestic. The inclement weather has also interfered with transportation on some lines, making the movement slow and causing an acute shortage in some sections with a consequent hardening in prices, and an apparent total absence of spot coal.

In the extreme East the coastwise movement is slow and uncertain, due to heavy storms, and with the coldest weather reported for a number of years at some centers, the situation is rapidly becoming grave. There is little or no coal on demurrage and buyers are being forced into the market. At Pittsburg, domestic has had a sharp increase and steam a slight improvement, with spot coke unusually scarce and prices ruling high. Baltimore reports the lowest temperature in 11 years, with trade good, but prices unchanged. In Ohio there is a noticeable shortness in the supplies of slack with some improvement in all lines and dealers rushed.

Through the Middle West requisitions are so heavy that operators are refusing orders. Slack has also shown some improvement here and there is a stronger buying movement in all sizes. The first tangible evidence of any apprehension over the strike possibilities (Apr. 1) has appeared in the issuance of orders by several Middle West railroads to begin storing coal, effective Jan. 1.

In the Rocky Mountain States and on the Pacific Coast, the trade remains quiet and normal with good supplies on hand and prices unchanged.

Boston, Mass.

The cold wave has stimulated the market so that trade is decidedly more active. Arrivals of bituminous have been heavy at all points, but the outlook is for increased consumption during January and probably a stiffening in prices.

At Mystic Wharf, Boston, \$4 is asked for the better grades and no surplus is offered. At Providence buyers are forced into the market frequently and have to make a canvass of wholesalers before finding coal for sale, most of the shippers having their hands full in caring for the needs of customers to whom

they are obligated on contract. In this respect there is no change nor is there likely to be any, except for the worse. A January gale, with the loss of a few cargoes, would be disastrous in more ways than one and in many different quarters. Coal at the Virginia terminals is rumored short, although nothing higher than \$2.75 has so far been heard for spot coal f.o.b.

The recent purchase of 3,400,000 tons of Clinch Valley coal by the so called "Mellen System" leads the trade to wonder if still larger tonnages are in the way of being placed with the southern lines from West Virginia. The Baltimore & Ohio and the Pennsylvania have heretofore hauled most of the fuel supply for the New England roads and late developments look like a change in policy.

Freights are firmer than a week ago, at around \$1 to \$1.10 for the larger craft, Hampton Roads to Boston, but there is not so much demand as a month ago. With small tonnages coming down the agencies are cautious about chartering vessels, especially when they are required to guarantee loading within a specified time.

New York

The stormy weather of the past week has caused more than the usual number of inquiries for spot cargoes. However, little price change has resulted, owing to the large number of cargoes loaded in boats awaiting the arrival of steamers, which have been from five to ten days overdue on account of rough weather. The snow storm of Jan. 8 which threatened to be of serious proportions and which, it was hoped, would add some strength to the coal market, ended in rather a disappointing manner, with rain, which washed away practically all traces of the snow.

All the loading piers are considerably hampered in their work by the freezing of the coal in the cars.

Aside from coal loaded in boats awaiting arrival of steamers there is apparently only a few loaded cargoes of demurrage coal and most of the product now being shipped into this market appears to be for loading on contract.

Philadelphia, Penn.

The week just past has been featured by the coldest weather that has been experienced in this vicinity for some

years. This, added to the heavy snow storms, has made the coal dealer's life anything but enviable. While the market had been a little flat, yet there was no indication of a curtailment in demand for certain sizes, which were hard to get, but the cold and snow have interfered with transportation, handicapping the railroads in delivery to the yards, and the hauling by the dealers. Stove, chestnut and pea coal seem to continue in good demand, and orders for these sizes have been coming in during the last few days, far in excess of the dealers' capacity to deliver. There also seems to be a better demand for buckwheat, while the output of rice is well taken care of.

The wholesale market is also handicapped to a certain extent by the weather conditions. Even without the impetus of extremely cold weather, little if any coal was going into stock, with the possible exception of egg, and with the added demand occasioned by the storms, and the consequent blocking and delay to railroad traffic, matters are in a very chaotic condition.

Pittsburg

Bituminous — Joint interstate wage conferences for the central competitive territory are likely to be revived in connection with the new wage scale to be arranged for the period beginning Apr. 1. The miners actively took up the problem some time ago of rehabilitating the interstate agreement and last month reached an understanding with Pittsburg and Ohio operators to the effect that they were willing to go into conference with the Indiana operators, the conference to determine whether the Illinois operators should be admitted. The latter are desirous of entering an interstate arrangement, the uncertainty as to the admission of Illinois being due to objection from without the state. Thus a tristate agreement seems already assured. The miners' international convention will start in Indianapolis, Jan. 16, and formulate the miners' demands for the two-year period beginning Apr. 1. The general expectation is that the demand will be for advances averaging about 10 per cent.

Mine operation continues to be interfered with by holiday conditions, particularly for the celebration of the Greek Christmas, which occurs at the end of next week. Domestic demand has increased sharply in the past week, and

manufacturing has improved slightly. Manufacturing consumers will soon start laying in the stocks they usually accumulate before the expiration of a scale, and prospects are that mine operations will be unusually heavy for the next three months. We continue to quote: Nut, \$1.05@1.10; mine-run, \$1.10@1.15; ¾-in., \$1.20@1.25; 1¼-in., \$1.35@1.40, slack, 70@75c. per ton, at mine, Pittsburgh district.

Connellsville Coke—Coke for spot shipment is extremely scarce, and has been so for a fortnight. Prices have been advancing, until in the past two or three days \$1.85 has been paid freely for such coke as could be found. There remains much unsatisfied demand, both from consumers and operators and from brokers who are short on their contracts. Rumors are in circulation of exceptionally high prices being paid, up to \$2.25, but these cannot be verified. The demand for spot coke is due exclusively to insufficient shipments on contract. No interest is manifested in contracts now, as almost all the business has been put through, and those who still wish to contract prefer to wait until the excitement is over in the spot market. The shortage is due to reduced production, on account of the foreign holidays, at a time when production ought to be increased slightly. We quote: Prompt furnace, \$1.85; contract furnace, \$1.70@1.75; prompt foundry, \$1.90@2; contract foundry, \$2.10@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Dec. 30, at 294,189 tons, a decrease of 25,000 tons, and shipments at 3119 cars to Pittsburgh, 4480 cars to points West and 828 cars to points East, a total of 8427 cars, a decrease of 1045 cars.

Baltimore, Md.

Prospects for an improvement in local market conditions have come with the big drop in temperature in this section, to the coldest weather experienced for more than 11 years, and operators have hopes of increased sales with better prices.

Had the cold weather been delayed for another week, there is not much doubt, according to the statement made by men prominent in the trade here, but that there would have been a rush for more coal on the part of consumers. Coming so soon after holidays, it found many of the largest consumers with stock on hand, which was purchased before Christmas; consequently they were not compelled to enter the market.

Prices for coal have not been affected by the marked change in the weather. Low-grade coal is still being quoted at 75 and 80c. per ton. The better grades can be purchased from \$1 to \$1.30 per

ton, while the best grades of big vein coal are selling at from \$1.30 to \$1.60.

The coke market was inactive during the past week, practically no inquiries being received nor sales recorded.

Buffalo, N. Y.

The sudden cold weather has firmed up the anthracite trade, though the shippers are easy, having been able to fill many old orders during the warm December. Egg is plenty and if it continues to be a surplus the shippers will soon take tonnage here to load for winter holding, as some of them commonly do. Stove and chestnut continue scarce.

Bituminous slack is getting stiffer and coke is doing better. The severe weather has made the demand for the mixture of slack and screenings for office heating unusually scarce. Screenings have been hard to get for some time. There is an occasional offering of slack at a low price, but that is apparently through exceptional conditions of some sort.

While the quotations of soft coal remain the same there is a firmer feeling in the market, in spite of no increased movement just now, for the general opinion is that this year will do more for the trade than the last did, and that it is time to get ready for it. Pittsburgh three-quarter is held at \$2.50, mine-run at \$2.40 and slack at \$2, with Allegheny Valley, 15@25c. less. Pig-iron sales are still helping coke, which is stronger at \$4.25 for best Connellsville foundry and \$3.50 for stock coke.

Cleveland, Ohio

The conditions in the domestic line during the past week has been exceptionally good. Owing to the severe weather, the mines have been running full on domestic lump, but there is little, if any, improvement in the steam line.

Slack of all kinds is in great demand, and prices gradually increasing. Pittsburgh Youghiogheny slack has advanced to 85c.; No. 8, from 80c. to 90c., and No. 6, Middle district, 90c. to \$1. Jobbers have been buying all the slack that they could possibly get hold of for future delivery. The general impression in the anthracite region, as well as the bituminous, is that slack will reach a higher price this year than for a number of years past, due to the expected strike.

Columbus, Ohio

The cold wave in Ohio and adjoining states, which appeared shortly after the first of the year, caused quite an increase in coal tonnage, although the full benefit will not be felt until later. Prices in every grade became firmer and the general tone of the market has improved. Operators, jobbers and retailers are more optimistic of the future and it is believed

the next few months will show up better than any this season.

Operations in the various Ohio fields since the holiday vacation have been more active. It is estimated that about 75 per cent. of normal was shipped from the Hocking Valley district and the same percentage prevails in the Pomeroy Bend district. In Jackson and Cambridge districts the percentage is larger, while in eastern Ohio the movement is not quite as large.

The trade in small sizes is more active in every section and prices have advanced materially. The surplus of fine coal caused by the rather active Lake season is now exhausted and users have to depend on the daily production for their needs. As a result prices are higher and there is some difficulty experienced in securing prompt shipments.

Prices prevailing in Ohio are as follows:

Domestic lump in the Pomeroy Bend district	\$1.60@1.75
Domestic lump in the Hocking Valley	1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in the Hocking Valley	1.05@1.15
Mine-run in eastern Ohio	0.95@1.00
Coarse slack	0.45@1.55
Nut, pea and slack	0.50@0.60

Cincinnati, Ohio

The excessive cold weather which arrived in this part of the country a few days ago was most welcome, and has resulted in the greatest activity seen in the local offices for months. The coal men are all greatly cheered over the outlook except the retailers, who are being swamped under rush orders. But even they have no cause for complaint, since such orders as these do not stand long on the matter of price. This holds true in the wholesale trade also, and there has been a decided stiffening in prices, particular in domestic lump.

The situation is rather unusual, for as a rule domestic fuel is in good demand in December and January, while the steam coals are usually soft. Actual conditions were the reverse of this until the extreme cold weather stiffened the domestic market. Steam had been showing a steady increase until the market was in fairly good shape, while domestic continued unusually weak, due, no doubt, as to the mild weather.

Thurmond, W. Va.

There is a distinctly better feeling among the New River operators and selling agencies as to the price of coal for 1912. They are all thoroughly disgusted with low prices and taking contracts at any figure. Of course, there are a number of cheap coal contracts that run well into the year, but the operators are determined to obtain \$1.20 for their product at the mines and the buyers of smokeless from this district may make up their minds that they will have to pay

that price. The coal is worth that much, based on the average mine costs plus a reasonable profit or in comparison with prices now paid for lower grade coals from other parts of the country.

Actual mining costs are increasing and there is a decided tendency being shown to improve the inspection and preparation of the coal, which also costs money and for which the operators should derive some benefit in the way of better returns for the coal.

The government is largely responsible for the low prices of the past year. The two departments that use most of the New River-Pocahontas coals not only practically forced the operators to put in low prices, but also have, in many instances, imposed such severe and unfair penalties for coals not up to their standards (without paying any premiums for the better grades) that little money has been made on their contracts.

Charleston, W. Va.

The cold weather of the past week caused some activity with the operators as well as a feeling that West Virginia was not to be ignored after all in having a little cold weather.

While the situation could be better, which is always true, there is a general feeling of satisfaction with present conditions. The movement for better things, begun in the closing months of the year, seems to have continued thus far in the new year. Indications are strong for a much larger output during the present fiscal year ending June 30 than for the previous fiscal year.

Memphis, Tenn.

The dropping of the temperature at Memphis down as low as 26°, has stiffened up the local market materially. Our local prices are unchanged from what they have been for the past 60 days in retail. We are selling Kentucky lump coal at \$4; nut, \$3.50; and pea-and-slack at \$2.10; Pittsburg, \$4.75; Jellico and Cahaba coal, \$4.75; Piper, which is the best coal that enters Memphis, at \$5.

The west Kentucky mines are selling on payments of \$1.50 for lump, \$1.35 for No. 2, \$1.10 for nut, and \$1 for mine-run. That applies on current business; contracts are in force at much lower prices.

The Alabama people, as usual at this and most any time of the year, get a good price for their product, being as high as \$2.25 at mines for their Carbon Hill coals. Jellico is not as stiff as it usually is at this time of the year and good black coal can be secured for \$2.15 and \$2.25.

Nashville, Tenn.

The first real cold winter snap of weather is with us this week. The past two or three days have been unusually

cold, with indications that it will probably last a few days longer.

Screenings are scarce and are in great demand, being more eagerly sought for and with a better price offered than at any time since last fall. These conditions will exist for some time to come.

The prevailing prices in this field are as follows:

Standard lump	.....\$1.50
Standard nut	.....1.00@1.10
1½-in. screenings	.....0.35@0.45
Mine-run	.....0.85@1.00

Indianapolis

Zero weather, the first of the year, coming as it does after many weeks of mild weather, did just what the coal producers have been predicting it would, caught many retail dealers short of fuel. Because the weather was mild, the coal jobber bought lightly, and they had little or no coal in storage. Now they are all clamoring for coal, with rush orders; the railroads will be congested, and already there is real suffering in the North and Northwest.

For the first time in a long while the Indiana companies have been deluged with rush carload requisitions, and for the first time they have been forced to turn down many orders. It will require a week or two to catch up with the demand even with the most favorable transportation facilities. The cold wave is assuredly a great help to the mining sections of the state.

Chicago

With Chicago in the grip of the coldest wave experienced in three years the demand for coal has increased on all sides and a distinct betterment in the tone of the market is noticeable.

Dealers in Hocking, especially those not carrying heavy stocks, were among the first to feel the effect of the cold snap and their orders to the mines have largely increased. A stronger buying movement among the retailers has caused most of the weak spots in the Cartersville coal to disappear and the circular price is now \$1.50, f.o.b. mines. There has been a noticeable increase in the amount of buying in the screenings market and an addition of 5c. a ton has been made to the price of most screenings.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	.....\$2.47@2.62
Egg	.....2.47@2.62
Steam lump	.....2.10@2.20
Screenings	.....1.37@1.52
Springfield:	
Domestic lump	.....\$2.07@2.32
Steam lump	.....1.92@1.97
Mine-run	.....1.82@1.87
Screenings	.....1.37@1.42
Clinton:	
Domestic lump	.....\$2.12@2.27
Steam lump	.....2.00@2.15
Mine-run	.....1.82@1.97
Screenings	.....1.42@1.52
Pocahontas and New River:	
Mine-run	.....\$3.05
Lump and egg	.....\$3.65@3.90

Coke—Prices asked for coke are: Con-

nellsville and Wise County, \$4.50@4.65; by-product, egg and stove, \$4.85; by-product, nut, \$4.55@4.65; gas house, \$4.85.

Minneapolis—St. Paul

Coal conditions in this vicinity have been almost ideal during the last week, and the coal trade could not wish for any better weather than has prevailed since Christmas. The thermometer has registered below zero almost continually since that time, and the past three days it has been hovering around 20 deg. below. Government officials report Friday the coldest day we have had for eight years.

Retailers are swamped with rush orders from every section of the Twin Cities, and a great many dealers have arranged for Sunday deliveries in an effort to keep up with the demand. Teams are scarce as the ice crop is being harvested and hauling is being pushed while the sleighing is good. For the next 10 days the railroads will be bringing into Minneapolis and St. Paul an average of between 500 and 600 carloads of coal a day, and this will not any more than fill the demand if the weather continues as cold as it has been during the past week. Wholesale men estimate that the normal consumption of coal in Minneapolis is about 2700 tons daily, but the consumption recently has been far above this average. This is for Minneapolis only, and St. Paul is not far behind.

Prices at the docks are reported better, and Youghioghney and Pocahontas in all sizes are selling at circular. Almost all grades of Illinois coal have taken a jump in price. Franklin County coal now selling for \$1.75. All traveling salesmen have gone back on the road and are taking advantage of the present cold snap to illustrate to the dealer in the country the necessity of keeping large stocks on hand.

St. Louis, Mo.

The cold weather that arrived the latter part of last week and which held out to some extent during the present week, caused the price of coal to advance. This was, perhaps, most unexpected in the Mount Olive coal, which went up for the first time this winter. Standard coal also advanced beginning last Saturday, and grew stronger Monday, although it still has a tendency to weaken at times on account of the overproduction. Cartersville prices also increased some on account of the increased demand from the country.

Some of the railroads issued orders, effective the first of the month, for the storing of coal, and the Big Four will store 1000 tons a day from now until Apr. 1 at Harrisburg, Ill. The Missouri Pacific-Iron Mountain System in the past two or three weeks has arranged for storage supplies of approximately 30,000

tons, and it is understood that they are giving out small orders right along. The average price for this storage coal is 97½c. mine-run. The Rock Island, M., K. & T. and Burlington have also been in the market, but for small quantities, inasmuch as a large requisition might put the price up. It is expected that the Cotton Belt will shortly start storing, and the Illinois Central, it is rumored, will start their storage piles on the first of February. At the present time the Illinois Central's mines are not working full time, producing more coal now than they have requirements for.

Manufacturing plants, or at least a few of them, have inquiries out for storage supplies, depending upon the news they expect the latter part of this week from a conference at Indianapolis between the operators and the miners. There seems to be a feeling that there will be trouble in April, although everybody tries to assume an optimistic air that it will only be a suspension of a few weeks.

The prevailing prices are as follows:

Franklin County	
Lump and egg.....	\$1.50@1.65
No. 1 nut.....	1.40@1.50
No. 2 nut.....	1.35@1.40
No. 3 nut.....	1.20@1.25
2-in. screenings.....	0.65@0.70
Cartersville	
Lump and egg.....	\$1.35@1.50
No. 1 nut.....	1.20@1.30
No. 2 nut.....	1.10@1.20
No. 3 nut.....	0.95@1.00
Screenings.....	0.60@0.65
Mine-run.....	0.97½@1.05
No. 1 washed.....	1.60@1.70
No. 2 washed.....	1.40@1.50
No. 3 washed.....	1.25@1.30
No. 4 washed.....	0.90@1.00
No. 5 washed.....	0.40@0.45
Standard	
6-in. lump.....	\$1.05@1.10
2-in. lump.....	0.95@1.00
3x6-in. egg.....	0.90
No. 1 nut.....	0.70@0.75
No. 2 nut.....	0.65@0.70
Screenings.....	0.50@0.55
Mt. Olive	
6-in. lump.....	\$1.50
3-in. lump.....	1.40
3x6-in. egg.....	1.20
No. 1 nut.....	1.00
No. 2 nut.....	0.80

There has been a fair demand in anthracite, especially the chestnut size, at current prices. The demand for coke, especially gas house, exceeds the supply, and it is hard to get at \$4.65, St. Louis, while byproduct is moving fairly well at \$4.75. There is a fair demand in the wagon-load business for smokeless egg and lump, which retails at \$6 to the consumer.

Portland, Ore.

Colder weather has prevailed here for a week and there has been a slight increase in the demand for coal. A fair amount of business is looked for should this weather continue for three or four weeks. So far the temperature in the western part of the state has been mild and eastern Oregon has not had severe weather. The demand for coal therefore has been below the usual average.

No new shipments have arrived here from Australia since the steamer

"Stratheran" about six weeks ago brought a cargo. Small shipments are being made to this port from the mines at Coos Bay. Values are unchanged and there is no probability of any being made unless the weather creates a sudden demand so that it will become necessary to increase the cost of delivery.

Spokane, Wash.

The prices of coal in Spokane and the surrounding territory have remained unchanged during the week ending Jan. 3. Prices continue as follows, per ton:

Kind	Wholesale	Retail
Rock Springs.....	\$7.20	\$9.00
Owl Creek.....	7.20	9.00
Kirby.....	7.20	9.00
Carney.....	6.70	8.50
Bearcreek.....	6.35	8.25
Roslyn steam.....	5.25	6.25
Canadian steam.....	5.25	6.25

The general conditions are steady, and although there is a cold snap at the present time, it is not expected to last. The shipments continue to be good, and there is not the slightest chance for a fuel shortage this winter.

Production and Transportation Statistics

BALTIMORE & OHIO R.R. Co.

The coal and coke shipments over the lines of the Baltimore & Ohio R.R. for the month of November, 1911, and for the same month of the previous year, were as follows:

	1911	1910
Coal.....	2,750,678	2,563,084
Coke.....	334,187	311,581
Total.....	3,084,865	2,874,665

THE PENNSYLVANIA R.R. Co.

Statement of coal and coke carried on the Pennsylvania R.R. Co.'s lines east of Pittsburgh and Erie for November and first 11 months of 1911, in short tons:

	November	First 11 Months
Anthracite.....	1,161,287	10,742,344
Bituminous.....	3,886,364	38,437,959
Coke.....	913,487	9,728,136
Total.....	5,961,138	58,908,439

ANTHRACITE SHIPMENTS IN 1911

The following is a detailed statement of total shipments of anthracite for the year of 1911 as compared with 1910:

Companies	1910	1911
Philadelphia & Reading.....	12,445,733	13,265,758
Lehigh Valley.....	11,195,765	12,603,000
Jersey Central.....	8,519,135	9,218,802
Delaware, Lack. & West.....	9,589,076	9,869,620
Delaware & Hudson.....	6,578,356	7,206,731
Pennsylvania.....	6,250,976	6,494,733
Erie.....	7,554,198	8,800,179
N. Y., Ontario & West.....	2,772,547	2,495,476
Total.....	64,905,786	69,954,299

THE CAR SITUATION

The current report of the American Railway Association on car surpluses and shortages is as follows:

The total car surplus, Dec. 20, was 88,646, or an increase of 34,806 over the period ended Dec. 6. The increase has been chiefly in Ohio, Michigan, western Pennsylvania, Iowa, Illinois, Minnesota,

Wisconsin, the Dakotas, Oregon, Idaho, California and Arizona. About 78 per cent. of the total increase is in box and coal cars. The total car shortage decreased about 30 per cent.

Good service is being given coal shippers by the railroads, considering the amount of all sorts of freight moving, which is quite large in spite of complaints of poor business. Deliveries are a trifle slower than they were, but the mines are able to get all the cars they need.

Financial Notes

The directors of the Pittsburg Coal Co. have declared a quarterly dividend of 1¼%, payable Jan. 25.

The consummation of the proposed consolidation of 38 of the large companies in the Ohio No. 8 district is expected to be effected early next month.

The shares of the Rhode Island Coal Co., having a par value of \$10, sold down to 47c. on Boston Curb, Dec. 27. Early in 1910 this stock was quoted at \$12½ and the present quotation represents a total shrinkage of \$4,800,000.

Reports from the iron- and steel-manufacturing districts are to the effect that an increasing number of blast furnaces are in operation, and the indications are that the mills of the United States Steel Corporation will soon be running at a large percentage of their full capacity.

The American Coal Products Co. has issued \$2,500,000 preferred stock to yield 6.67%, which is being offered at 105. The proceeds will be used for improvements and to retire \$1,500,000 notes bearing 5% interest. The net quick assets of this company, including the new stock, are \$5,998,352, and the estimated earnings for 1911 are \$1,250,000, or equal to 50% of the new issue. Average earnings for past nine years equal about 48% of the new stock.

Foreign Markets

GREAT BRITAIN

Business is on a small scale at present. Tonnage arrivals are unsatisfactory and concessions in price are obtainable for spot shipment. For forward delivery, however, the tone is firm. Quotations are approximately as follows:

Best Welsh steam coal.....	\$4.14@4.20
Seconds.....	4.02@4.08
Thirds.....	3.78
Best dry coals.....	4.02
Best Monmouthshire.....	3.78
Seconds.....	3.60
Best Cardiff small coals.....	2.16
Seconds.....	1.92

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent. discount.